

FAUNA  
BOREALI-AMERICANA;

OR THE

ZOOLOGY

OF THE

NORTHERN PARTS

OF

BRITISH AMERICA:

CONTAINING DESCRIPTIONS OF THE OBJECTS OF NATURAL HISTORY COLLECTED ON THE LATE NORTHERN  
LAND EXPEDITIONS UNDER COMMAND OF CAPTAIN SIR JOHN FRANKLIN, R.N.

PART THIRD.

THE FISH.

BY

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SURGEON AND NATURALIST TO THE EXPEDITIONS.

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ILLUSTRATED BY NUMEROUS PLATES.

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\* This specific name is adopted from Sibbald's *Scotia Illustrata*. In the Number of Yarrell's *British Fishes*, which has just appeared, it is called *Coregonus Willughbii*.

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All the above plates were executed with strict fidelity to the specimens placed before him by Mr. WATERHOUSE HAWKINS. Nos. 89 and 90 are etched on copper, 94, 95, 96, and 97, are drawn on zinc, and the remainder are lithographed. Two wood-cuts, printed with the text, are from slight sketches, after nature, by Lieutenant-Colonel Hamilton Smith. Figures of *Catostomus reticulatus*, *Forsterianus*, and *Sueurii*, will appear in the Natural History Appendix to Captain Back's forthcoming narrative.

\* Numbers of plates carried on from Volume II.

#### ERRATA.

- Page 30, line 9, after " five hundred " add " twenty-one."
- 10, for " twenty-seven " read " forty-seven."
- 34, in two last columns of the table, for " 111 " read " 131 ;" and in line of totals, for " 327 " read " 347," and for " 501 " read " 521."
- 80, line 1, for " [36] " read " [37]."
- 145, line 3, for " Wynn " read " Wynne."
- 174, line 3 from bottom, for " shorter labials " read " longer labials."
- 194, line 1, for " tahn " read " than."
- 241, line 2 from bottom, before " *maculata* " insert " *Lota*."
- 271, lines 6, 8, 12, and 13 from bottom, *dele* " very."

## INTRODUCTION.

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NOTWITHSTANDING the high rank which our countryman Ray occupies in the annals of Natural History as a founder of systematic ichthyology, that branch of science has been greatly neglected in this country,—yet Britain owes much of her wealth to her fisheries; and her seamen, traversing the ocean in all directions, are familiar with the finny inhabitants of almost every river in the world, as well as with the wonders of the deep. While the fish of the English seas were imperfectly known, it was not to be expected that those frequenting the waters of a remote colony would be more fully described; and, in fact, this volume of the Fauna owes comparatively little to the labours of previous writers in respect of the determination and description of species, though the arrangement and generic groups are adopted wholly from Cuvier. Forster, in the *Philosophical Transactions* of 1773, gives an account of four Hudson's Bay fish, three of which he erroneously identifies with European species; and he is the only ichthyologist that I have been able to cite respecting the fish which sport in the sea-like lakes and magnificent rivers of the portion of North America lying north of the St. Lawrence, and exceeding the whole of Europe in extent of territory. There is, I believe, no scientific account of the Canada fish, with the exception of M. Le Sueur's and Dr. Mitchill's descriptions of a few lacustrine species. Some of those inhabiting the seas of Newfoundland are included in the published volumes of the *Histoire des Poissons*, by Cuvier and Valenciennes. Fabricius's and the work last mentioned are my authorities for the Greenland fish, and I am indebted to the Appendices to the late Arctic Expeditions for those found on the northern shores of America. Pallas, Steller, and Tilesius have described the fish inhabiting the sea of Kamtschatka, and such of them as are known to range over to the Ame-

rican coast are included in this Fauna. Eschscholtz's description of a fish taken in Norfolk Sound is quoted, and as I can refer to no work containing any notice sufficiently detailed and accurate to determine the species, or even the genera, of those in the waters of New Caledonia, the popular accounts of voyagers and travellers, who have visited that country, have been occasionally transcribed at some length, to supply the want of scientific information.

The specimens described and figured in the following pages were chiefly collected by me at Cumberland House in latitude 54°, at Fort Enterprise in latitude 64°, and in the Arctic Sea at the mouth of the Coppermine River in latitude 67°, on Sir John Franklin's first journey\*; at Penetanguishene on Lake Huron in latitude 44°, in Great Bear Lake in latitude 64°, or in the canoe route between these places, on his second journey; and in the following quarters by the exertions of others, viz., on the Labrador coast of the Gulf of St. Lawrence, from whence I obtained a collection of the Salmon and Coregoni of the Mingan and Musquaw rivers, prepared by Mr. Cuming, of the Hudson's Bay Company; at Penetanguishene, where Mr. Todd, surgeon of the Naval depôt, procured me a suite of specimens which I submitted to the inspection of Baron Cuvier, together with those obtained on Sir John Franklin's second journey; and in the Albany River district latitude 51°, from whence I have very recently received a series of fresh-water fish in excellent condition: in addition to these, Dr. Gairdner, surgeon of the Hudson's Bay Company's establishment, at Fort Vancouver, on the Oregon or Columbia River, sent me a cask full of specimens, which, though much damaged on the voyage, have, with the aid of his valuable notes, furnished the only means I possess of obtaining a knowledge of the fish of that river, and enabled me to understand in part the popular descriptions given in Lewis and Clarke's narrative; Dr. Scouler, of the Dublin Institution, presented me with a curious salmon, which he obtained on the coast of New Caledonia; and I am indebted to Peter Warren Dease, Esq., for several kinds of trout from the interior of that country; by the kindness of Captain

\* The fish observed on Sir John Franklin's first journey are described, and a few of them figured, in the Appendix to his Narrative; but the specimens, which would have been of great use for comparison with those afterwards obtained, were destroyed by vermin during my absence on the second journey.

James Ross I have had the opportunity of describing and figuring the salmon procured by him on Sir John Ross's recent expedition; and still more lately I have obtained some useful specimens of the heads of fish, prepared by Mr. King during Captain Back's overland journey\*. It will be observed, that these different collections consist almost exclusively of the fresh-water, or anadromous species, that supply a principal article of diet to the natives and residents in the fur-countries, the smaller kinds which escape through the pretty wide meshes of the gill-nets in ordinary use there having been mostly overlooked. I am, however, indebted to John James Audubon, Esq., the celebrated American ornithologist, for a small but interesting collection, made on the coasts of Newfoundland; and Lieutenant-Colonel Hamilton Smith favoured me with sketches and notes of several Canada fish. But even with these advantages the work must be considered as very defective in marine species, and by no means complete even in the fresh-water ones. As it was not until after I returned to England from Sir John Franklin's last expedition that I entertained the idea of publishing a work of this nature, I had no inducement to avail myself of the opportunity which was afforded by our journey through Canada and the State of New York, for the collection of materials in aid of such an undertaking; and my numerous subsequent attempts to remedy this deficiency, by procuring specimens through correspondents, have been unsuccessful, except in the instances above mentioned. Upwards of four hundred species of European fish are described in the *Histoire des Poissons*, or noticed in the *Règne Animal*, and it may be fairly inferred, that a still greater number inhabit the fresh waters of British America, or the Atlantic, Arctic and Pacific seas which bathe its shores†. The present work contains only one hundred and forty species, so that much remains to be accomplished by resident naturalists; and with the view of facilitating the labours of those who may undertake

\* Many of the specimens, having arrived at different periods, and when the printing of the work was considerably advanced, could not be noticed in their proper places, and their descriptions have therefore been introduced either at the end of the families to which they belong, or in the Appendix; but an attempt has been made to remedy this irregularity by arranging the table of contents.

† De Witt Clinton estimates the species of fish in the United States at four hundred, and Dr. Mitchill describes one hundred and seventy that are brought to the market of New York.

the task, I have endeavoured by minuteness of description, aided by correct figures, to render their recognition of the fish already named more certain. I have, also, in consideration of the difficulty of procuring books in remote districts, entered more fully into generic details than is usual in a local Fauna, and likewise given compendious notices of most of the families mentioned in the *Règne Animal*, borrowing largely not only from that work, but also from the *Histoire des Poissons*. Cuvier divides the class in the following manner:—

*First Series.* FISH PROPERLY SO CALLED.

- A. Upper jaw formed externally of intermaxillaries and moveable labials; and posteriorly of a palatine arch composed of palate bones, pterygoid processes, jugal, petrous, and squamous bones, constituting a sort of interior jaw as in birds and snakes, and furnishing posteriorly an articular cavity for the condyle of the lower jaw.
- a. *Gills in leaves.*
- Order 1. ACANTHOPTERYGII. (vide p. 108. F. B. A.)
2. MALACOPTERYGII ABDOMINALES. (p. 109.)
3. MALACOPTERYGII SUB-BRACHIATI. (p. 241.)
4. MALACOPTERYGII APODES. (p. 267.)
- b. *Gills in tufts.*
5. LOPHOBRANCHII. (p. 276.)
- B. Labials soldered to the intermaxillaries: palatine arch united to the cranium by suture and not admitting of motion.
6. PLECTOGNATHII. (p. 277.)

*Second Series.* CHONDROPTERYGII or CARTILAGINOUS FISH.

- A. Gill openings of the ordinary form, having a moveable gill-plate. (ELEUTHEROPOMI.) (p. 278.)
7. STURIONIDÆ. (p. 278.)
- B. Canals communicating with gills having fixed edges, and opening exteriorly by one or several holes. (TREMATOPNEONTES.) (p. 287.)
8. SELACHII. (p. 287.)
9. CYCLOSTOMATA. (p. 292.)



As this arrangement\* is very different from the quinary one advocated by Mc Leay, the nomenclature of that gentleman and his followers, which is adopted in the second volume of this Fauna, is inapplicable here, and Cuvier's names are therefore given to the various groups, except in a few instances, where the French term used by him did not readily admit of a direct Latin translation, as in the case of "*Poissons Plats*," for which *Platessoideæ* is substituted.

I gladly avail myself of this introductory chapter to notice the kindness of various gentlemen by whom I have been assisted in the progress of the work. In the first place, I have to express my gratitude to the Right Honourable Lord Glenelg, Secretary of State, for his recommendation of an additional grant in aid of the publication, and to William Hay, Esq., Under Secretary for Colonial Affairs, for his efficient support of my application, and invariable personal kindness whenever I have had occasion to address him. I have likewise to express my obligations in an especial manner to Captain Pelly, Governor of the Hudson's Bay Company, and Nicolas Garry, Esq., Deputy Governor, for the liberality with which they have always promoted my endeavours to illustrate the zoology of the fur-countries; also to James Keith, Esq., of La Chine, and to the other gentlemen already named, to whom I am indebted for specimens of American fish. My thanks are also due to the following gentlemen, who procured for me, in most instances with considerable difficulty and trouble, specimens of European fish for the purpose of comparison, viz.: Dr. Graham, F.R.S.E., Professor of Botany, Edinburgh; Mr. Scobie, of Kioldale, Sutherlandshire; Mr. John Burnet of Dumfries; P. J. Selby, Esq., F.R.S.E., of Twissel House; G. A. W. Arnott, Esq., F.R.S.E.; Captain Barou, Royal Engineers; John Lloyd Wynne, Esq., of Coëd-Coch, Denbighshire; the Rev. T. W. Booth, Vicar of Friskney, Lincolnshire, and W. Yarrell, Esq.,

\* Professor Agassiz, of Neuchâtel, has recently given to the world an entirely new arrangement of fish, founded chiefly on the form and structure of the scales, upon which he establishes four orders:—1. CTENOÏDIANS, which are the *Acanthopterygii* of Cuvier and Artedi, with the exception of those which have smooth scales, and with the addition of the *Flat-fish*, or *Platessoideæ*, removed from the *Malacopterygii*. 2. CYCLOÏDIANS, which are principally *Malacopterygii*, but take in also the smooth-scaled fishes excluded from the *Acanthopterygii*. 3. GANOÏDIANS, comprising the *Lophobranchii*, *Plectognathii*, and *Sturionideæ*, together with a great number of extinct genera. 4. PLACOÏDIANS, which are the *Setachi* and *Cyclostomata* of Cuvier.

whose beautiful, able, and accurate work on British Ichthyology, now in the course of publication, will, it is to be hoped, be a means of reviving, in this country, a taste for that branch of natural history. Lastly, I have again to acknowledge the attention of the officers of the British Museum, whenever I have had occasion to consult its library, or natural history collection, and particularly that of my friend J. E. Gray, Esq., upon whose valuable time I have had occasion frequently to draw very largely. Part of the specimens described in this work were, as I have already mentioned, examined and named by the truly illustrious Cuvier, and I would gladly have submitted the rest to his inspection as they arrived; but in common with other naturalists, and the civilized world in general, I have had to deplore his death, which, notwithstanding the vastness of his labours in zoology, must be considered as premature for the interests of science; though we look with confidence to his able coadjutor, M. Valenciennes, for the completion of the unrivalled *Histoire des Poissons*. I may also notice here, the deaths of two naturalists to whom the former volumes of this work are much indebted. Their walk in science was indeed far beneath the lofty platform which Cuvier constructed, but they were unrivalled in the paths they chose for themselves. I allude, in the first place, to Mr. David Douglas, to whose researches in North California, and on the banks of the Columbia, we owe many of the most beautiful hardy flowers which ornament our gardens. He perished miserably in the Sandwich Islands, by falling into a pit in which a wild bull had been previously taken, where the infuriated animal gored him to death. Thomas Drummond, of Forfar, the other gentleman whose loss I have to record, was my friend and associate on Sir John Franklin's second expedition. An enthusiastic admirer of animals and plants, he was eminently qualified for a collector of objects of natural history, by an extreme quickness and acuteness of vision, and a wonderful tact in detecting a new species. His favourite pursuits were carried on under circumstances of domestic discomfort and difficulties, that would have quelled a meaner spirit,—the contemplation of the works of God on the mountain top, or in the bosom of the forest, serving to soothe the sorrows of his wounded mind. In his company, and by his aid, most of the birds described in the second volume of

this Fauna were procured : by his unremitting industry and strenuous exertions a very great proportion of the plants included in Dr. Hooker's *Flora Boreali-Americana* were obtained ; and the *Musci Americani* \*, published on the same plan with his beautiful *Musci Scotici*, will be a lasting monument of his activity and penetration as a cryptogamic botanist. After making very large collections of plants in various parts of the United States, and in the province of Texas, he died in the Island of Cuba, where he had landed on his way to the Florida Keys.

\* In two volumes quarto.

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# NORTHERN ZOOLOGY.

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PART III.

P I S C E S.

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ACANTHOPTERYGII.

PERCOIDEÆ.

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[1.] 1. PERCA FLAVESCENS. (Cuvier.) *American Perch.*

FAMILY, Percoidæ. GENUS, Perca, CUV.

Yellow perch (*Bodianus flavescens*). MITCHILL, *Ph. Trans. New York*, i., p. 421. No. 7.

SMITH, *Fish of Mass.*

*Perca flavescens*. CUV. *Reg. An.*, ii., p. 133.

La perche jaunâtre d'Amérique (*Perca flavescens*). CUV. et VAL, ii., p. 46.

PLATE LXXIV.

THIS fish has a close resemblance to the river Perch of Europe. Our specimen was taken in Lake Huron, where it frequents steep banks and affords much sport to the angler from the eagerness with which it snaps at the bait. In the month of May it spawns and then resorts in great numbers to the mouths of rivulets. It does not, as far as I could learn, exist in any of the streams that flow into Hudson's Bay or the Arctic sea, and most probably it does not range farther north than the 49th or 50th parallels of latitude, between which the rivers that fall into the chain of Great Canadian Lakes originate. Dr. J. V. C. Smith, author of a popular work on the Fish of Massachusetts, enumerates the *Perca fluviatilis* among the fish of that State, but he has most likely been misled by the report of anglers who have mistaken the *P. flavescens* for it. It is certain, that no naturalist who had the opportunity of comparing these two species with one another, would have placed them in different genera, as Dr. Smith has done. Dr. Mitchill includes in *Bodianus* fish of several genera together with the subject of this article, which is a true perch; while under *Perca* he places only *Labrax lineatus* and *Centropristis nigricans* of

Cuvier. The mistake of confounding the American perches with their European representative is a very excusable one, where opportunities of comparison do not exist; and Baron Cuvier, after describing *P. flavescens*, *P. serrato-granulata*, and *P. granulata*, which inhabit the Atlantic streams of New York and the neighbouring States, adds "*Elles seraient certainement confondues avec le nôtre, par un voyageur qui les observerait chacun isolément et sans pouvoir en faire, comme nous, un rapprochement et une comparaison immédiate.*"

## DESCRIPTION

Of a specimen taken at Penetanguishene, Lake Huron, May, 1825.

COLOUR.—General tint of the *back* greenish-yellow; of the *sides* golden-yellow with minute black specks; and of the *belly* whitish. Nine or ten dark *bands* descend from the back to the sides, and taper away towards the belly; the alternate ones are shorter, and on the tail and shoulders they are less distinctly defined: the longest band is opposite to the posterior part of the first dorsal fin, on which there is a large black mark.

FORM.—The *body* is moderately compressed, its greatest thickness being somewhat more than one half of its depth. Its *profile* is oblong, tapering more towards the tail, which is nearly cylindrical: its greatest *depth* is at the ventrals, and rather exceeds one-fourth of the total length, caudal included.

The *head* constitutes two-sevenths of the total length, and its height, at the eye, is equal to one-half its length, from the tip of the snout to the point of the gill-cover. The *forehead* is flat, but appears depressed, owing to the convexity of the nape. The *snout* is a little convex. The *orbits* are lateral, distant more than one of their own diameters from the tip of the snout, and more than two diameters from the point of the gill-cover. The *jaws* are equal. The *mouth* descends as it runs backwards, its posterior angle being under the centre of the orbit.

TEETH.—The *intermaxillaries*, *lower-jaw*, *knob of the vomer*, and edge of the *palate-bones*, are covered with very small, straight or slightly-curved densely-crowded teeth (*en velours*). The vault of the palate, posterior part of the vomer, and the pointed tongue, are smooth.

GILL-COVERS.—The *preoperculum* is narrow; its upper limb rising vertically forms a right angle with the lower one; and its edge is armed with small spinous teeth, those on the lower limb being directed forwards. The bony *operculum* terminates in a narrow sub-spinous point, beneath which there are three denticulations, with grooves running backwards from them. An acute-pointed membranous flap prolonged from the margin of the suboperculum conceals these parts in the recent fish. The edge of the *interoperculum* and posterior part of the *suboperculum* are minutely denticulated. The edges of the *humeral bones* are slightly grooved and denticulated, the denticulations being more obvious in some individuals than in others.

SCALES.—There are sixty scales on the lateral line, and twenty-two in a vertical row between the first dorsal and centre of the belly. The *scales* are rather small, their bases truncated and furrowed to near the middle (*striées en éventail*) by six grooves corresponding to eight minute lobes of the margin. A narrow border of the outer rounded edge is very minutely

streaked, producing teeth on the margin, visible under a lens. The length and breadth of a scale, taken from the side, are about equal, being two and a half lines. A linear inch measured on the sides or belly, longitudinally, contains twelve scales, the scales on the belly having, however, less vertical breadth. On the back an inch includes seventeen or eighteen. The asperity of the scales is perceptible to the finger, when it is drawn over them from the tail towards the head. The *lateral-line* is thrice as near to the back as to the belly, and is slightly arched till it passes the dorsal and anal fins, when it runs straight through the middle of the tail. It is marked on each scale by a tubular elevation, which is divided irregularly by an oblique depression.

FINS.—*Br.* 7—7; *D.* 13/ — 1/13; *P.* 14; *V.* 1/5; *A.* 2/8; *C.* 17½.

The *first dorsal* commences a little posterior to the point of the gill-cover and to the pectorals: its fourth and fifth rays are the highest: the first ray is slender and not half the height of the second; the last ray is so short as to be detected only by a close examination. The *second dorsal* commences a quarter of an inch from the first, the space between them being occupied by two or three *inter-spinous* bones without rays: its first ray is spinous, and is closely applied to the base of the second, which is thrice as long, distinctly articulated\* and divided at the tip: the remaining rays are all divided at their summits, but at their bases the articulations are obsolete. The *pectorals* originate opposite to the spinous point of the operculum; they are somewhat longer than the ventrals, which are attached opposite to the second spine of the first dorsal. The *anal* is rounded: its first ray is one-fourth part shorter than the second, both being spinous: the succeeding rays are articulated and branched, the five anterior ones being longer than the second spine, the others becoming successively shorter: its termination is opposite to that of the second dorsal. The *caudal* is distinctly forked, its base is scaly, the scales advancing farther on the outer rays and covering one-third of their length.

## DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from tip of upper-jaw to tips of caudal fin . . . . .	8	6	Length of attachment of <i>first dorsal</i> . . . . .	2	1
"    "    end of scales on central rays . . . . .	7	5	"    longest spine of ditto . . . . .	0	11
"    "    of ditto . . . . .	6	0	"    attachment of <i>second dorsal</i> . . . . .	1	2
"    "    end of dorsal and anal fins . . . . .	5	2	"    longest ray of ditto . . . . .	0	10
"    "    anus . . . . .	2	6	"    attachment of anal . . . . .	0	8½
"    "    origin of first dorsal . . . . .	2	3½	"    longest ray of ditto . . . . .	0	11½
"    "    tip of gill-cover . . . . .	1	6	"    pectorals . . . . .	1	2
"    "    nape . . . . .	0	8½	"    ventrals . . . . .	1	2
"    "    margin of orbit . . . . .	0	6½	"    lobes of caudal . . . . .	1	4
"    of orbit . . . . .	0	9	"    central rays of ditto . . . . .	0	9½
"    one intermaxillary . . . . .	0	9½	Depth of caudal fork, fin extended . . . . .	0	4
"    one labial . . . . .	1	1	Height of body at the first dorsal . . . . .	2	1
"    lower-jaw to its artic. with preop. . . . .					

Our *second specimen*, nearly of the same size, has only seven vertical lateral bands, with merely a little clouding in place of the intermediate shorter ones. Mr. Todd informed me that some specimens were covered with small black spots.

\* In the *Histoire des Poissons*, the two first rays of the second dorsal are described as spinous; but in our two specimens they are as we have mentioned. Our specimens were seen and named by Baron Cuvier.

[2.] 2. PERCA ACUTA. (Cuvier.) *Sharp-nosed Perch.*

La perche à museau pointu (*Perca acuta*). CUV. et VAL., ii., p. 49, pl. 10.

This species was found in Lake Ontario, by MM. Milbert and Le Sueur. It strongly resembles the *P. flavescens*, but its lower-jaw is proportionably longer, and its snout more pointed. It wants the black spot on the first dorsal.

*Perca gracilis* (Cuv. et Val., p. 50) is probably also a Canadian fish, but it has hitherto been found only in Lake Skaneateles, on the New-York side of Lake Ontario. It also resembles *P. flavescens*, but its preoperculum is not denticulated; the spine of the second dorsal is very short and slender, and the spot on the first dorsal small.

[3.] 1. PERCA (HURO) NIGRICANS. (Cuvier.) *The Huron.*

FAMILY, Percoideæ. GENUS, Perca. Sub-genus, HURO, CUVIER.

Le HURON (*Huro nigricans*). CUV. et VAL., ii., p. 124, t. 17. CUV. *Reg. An.*, ii., p. 135.

Baron Cuvier established this sub-genus on the inspection of a solitary specimen which was prepared for me by Mr. Todd at Penetanguishene, on Lake Huron. In the analytical table of genera, given in the *Histoire des Poissons*, it stands among the Percoideæ having their ventrals, containing only five soft rays, situated under the pectorals; seven rays in the branchiostegous membrane; two distinct dorsal fins, or one fin divided into two by a notch extending to its base; and all the teeth small and crowded like the pile of velvet (*dents en velours*). The specimen is a dried one, of the right side of the fish, and contains only six branchiostegous rays, nor is there a trace of another ever having been inserted into that limb of the os hyoides; yet in his description the Baron enumerates seven. Mr. Todd counted only six in the recent fish. The Baron says that the Huron would possess all the characters of the Perch, if it were not devoid of denticulations on the bones of the head and shoulder, and particularly on the preoperculum\*. Few fish of the family, he observes, possess this smooth-edged preoperculum, and, in fact, on reviewing the characters of his genera and sub-genera, we find, that of that

\* The want of denticulations in the preoperculum is considered to be merely a specific distinction in the *Perca flavescens*, CUV.

division which has the ventrals placed under the pectorals, the small genera of *Etelis*, *Aprion*, *Grystes*, *Aplodactylus*, *Bryttus*, and *Chironemus*, alone resemble the Huron, in having the preoperculum without either crenatures, denticulations, sharp points, or spines: some *Pomotis*, however, have the crenatures of this bone scarcely perceptible, and in *Pomatomus* its edge is finely ciliated. Of the Percoidæ whose ventrals are jugular or abdominal, *Aphritis*, *Bovichtus*, *Sphyzæna*, and *Paralepis*, have also a smooth preoperculum; *Trachinus* and *Percis* have two or three small bony points which are not perceptible through the soft parts, and *Percothis* has the edge of its bony preoperculum even, but there is attached to it a narrow border of dentated membrane. It would be easy, the Baron observes, to modify the characteristic phrases of the larger generic groups, so as to include the Huron and other similarly-isolated species; but this practice would lead to the erroneous belief of there being a more intimate connexion between these aberrant species and the types of the groups than actually exists; and as he aims at expressing, even by the subdivisions of his families, the affinities of the different beings composing them, it is more in accordance with his plan to give to every peculiar form a proper generic name. A smooth tongue is one of the characters of the genus *Perca*, which we have not been able to identify in the Huron, that member having been removed from our specimen, as has also the branchial apparatus. Mr. Todd mentions two plates of teeth on the superior pharyngeal bones and one on the lower. The figure in the *Histoire des Poissons* represents eleven soft rays in the second dorsal, three of them in dotted lines; there are only eight now existing in the specimen, but the skin immediately behind the last one is a little damaged, and from the contour of the fin, one is induced to think that at least one posterior ray has been destroyed.

This fish is known to the English settlers on the borders of Lake Huron, by the name of Black bass—the word “bass” being almost synonymous with perch. The same appellation is given, at New York, to the *Centropristis nigricans*, to which our fish has a general resemblance. The Huron is highly esteemed as an article of diet, its flesh being white, firm, and well-flavoured, and it is, in fact, considered to be the best fish that is caught in the lake during the summer months. It haunts deep holes at the mouths of rivers or edges of banks, and readily takes a hook baited with a small fish, or a piece of white rag trailed after a boat, as in fishing for mackerel. It does not exist to the northward of the Great Canadian Lakes.



## DESCRIPTION

Of the dried specimen.

FORM.—*Profile* elliptical, the ellipsis commencing acutely in the somewhat pointed chin and conical head, but passing gradually into the thickish tail. The *depth* of the body is greatest under the first dorsal, and appears to be about equal to the length of the head, or one-third of the total length, excluding the caudal. *Head* flat above, covered with scales as far as the posterior margin of the orbit: the forehead shows a slight median ridge with a more prominent lateral one, and there are many fine streaks on the upper margin of the orbit. The anterior sub-orbital bone is marked by some short diverging ridges, and the under and posterior margin of the orbit is more distinctly roughened by many small irregular prominences. The *orbit* is circular, situated close to the forehead, and two of its own diameters and a half above the articulation of the lower-jaw: it is also a diameter and a half behind the extremity of the upper-jaw, and four diameters from the point of the suboperculum, or most posterior part of the gill-cover. The *mouth* acquires a somewhat vertical aspect, from the chin, or tip of the lower-jaw, projecting about a quarter of an inch beyond it, and from its opening descending from the plane of the forehead at a considerable angle as it runs backwards; the articulation of the lower-jaw is opposite to the posterior margin of the orbit. The *labials* have a lengthened triangular form, the narrow apex only passing under the edge of the sub-orbital bone: the posterior dilated and truncated extremity projects considerably beyond the tip of the intermaxillary, and extends farther back than the orbit: it is further widened by the addition of a superior piece, or apophysis, whose corner is rounded. There are no pores in the *lower-jaw*, but two circular openings of canals in the bone are visible through the dried skin which covers them.

TEETH.—The opposing surfaces of the intermaxillaries and lower-jaw are covered with densely-crowded, curved, fine card-like teeth, or, as they ought perhaps to be called, in conformity with Cuvier's nomenclature, rather coarse "*dents en velours*"—the dental surface being broad anteriorly, and narrowing to a point behind. The transverse, anterior, projecting extremity of the vomer, and the outer edges of the palate-bones, are armed with finer teeth "*en velours*," the dental surface of the latter narrowing to a point posteriorly like those of the mandibles; there is, however, a detached but contiguous patch just beyond this point on the edge of the palate. The whole vault of the palate is smooth. The *tongue*, as we have already mentioned, has been removed, and if Mr. Todd's account of the pharyngeal teeth be correct, they are not distributed into the same number of patches as in the perch.

GILL-COVERS.—*Preoperculum* having a narrow upright limb, covered with smooth skin, there being a single small scale only, just above its angle: the lower limb is wider, and has three scales in a single row, which does not cover half its surface: the whole edge of the bone is smooth and even, with the exception of a very shallow wide notch at the base of the upper limb. The *interoperculum* is comparatively broad, its depth exceeding that of either the preoperculum or suboperculum; it is covered by a row of ten scales, which leave its under border naked. The bony *operculum* has an acute, oblique notch in its posterior

margin producing two thin points: the lower point is closely applied to the apex of the suboperculum, forming with it one thin obtuse plate, which, together with the upper point, are concealed by the membrane which borders them. The under margin of the *suboperculum* is slightly waved, forming two obscure lobes. As in many, or perhaps in most, of the percoideæ with scaly gill-covers, the margins of the pieces composing them are covered with smooth skin: there is even a wider naked space than usual behind the points of the operculum, and the anterior border of that bone is as wide and prominent as the limb of the preoperculum to which it adjoins. The forehead, snout, infra-orbital bones, and margins of the orbits, mandibles, labials, branchiostegous membranes and edges of the different opercular bones, are covered with smooth skin; the rest of the head, including the temples and top of the cranium as far as the *linea rostri basalis*\*, are clothed with tiled scales. The bones lining the posterior edge of the gill-openings are likewise scaleless, and their edges, though undulated, are destitute of spines or serratures. The nape is supported by a median ridge of the cranium, and a thin lateral one on each side equally high. There are also several inter-spinous bones anterior to the first dorsal. The *Branchiostegous membrane* contains six curved rays, the anterior ones cylindrical, the posterior ones becoming more and more flat and wider.

FINS.—*Br.* 6; *D.* 6/ — 2/8?; *P.* 15; *V.* 1/5; *A.* 3/11; *C.* 174.

The *pectorals* consist of fifteen rays, the first of which is short, and its articulations very obscure, being visible only at the tip and with a lens. The *ventrals* are attached directly under the pectorals, and contain six rays, of which the first is spinous and one-third shorter than the succeeding ones. The *first dorsal* consists of six acute spinous rays, having the connecting membrane notched between them: the first ray is one-third shorter than the third, which is the longest, and stands about an inch behind the insertions of the pectorals and ventrals: the fourth and fifth are nearly as long as the third. The *second dorsal* is one-third higher than the first, and commences nearly an inch behind the posterior insertion of the membrane of the latter: the two anterior rays are spinous and separated by membrane,—the first of them equal in height to the corresponding ray of the first dorsal: the third ray is simple but articulated; the succeeding ones are branched at the tips, and nearly equal to each other, the seventh being, however, rather the highest: the fifth ray is opposite to the anus, and the tenth (it is not certain whether this be the last or not, as the specimen is injured) is opposite to the fifth of the anal. The *anal* contains fifteen rays, the two first of them shorter, spinous, and very acute: the branched rays equal those of the dorsal in height: the first spinous ray stands half an inch behind the anus. If the fish, exclusive of the caudal-fin, be divided into three parts, the head will form one, and the first spine of the anal will stand at the commencement of the third. The space between the anal and caudal considerably exceeds that occupied by the attachment of the former. The *caudal* is somewhat rounded and very slightly emarginated: its base is covered with small scales, which terminate by an even line rounded off on the three exterior rays, while they cover the accessory short rays, above and below, to their tips, thus producing a notch at each end of the line.

SCALES.—The scales are rather large, the exterior edge forming a segment of a circle and

\* *Linea rostri basalis illa est, quæ per marginem orbitæ posteriorem transversim ducitur.*—NILSSON.

being quite smooth, the sides almost parallel, and the base truncated and crenated in correspondence with ten or eleven furrows which diverge from the centre like the sticks of a fan. There are sixty scales on the lateral line, exclusive of about nine smaller ones, forming a continuation of the same row on the base of the caudal, and twenty-six in a vertical row beneath the first dorsal, of which seven are above the row which forms the lateral line. A linear inch measured along the sides includes five scales and a half. The scales on the gill-covers are a little smaller than those on the body: those on the cheeks are still less, and the scales on the caudal, and on the space before the ventrals, are the smallest of all. A scale taken from the lateral line under the first dorsal is four and three-quarter lines wide and three and a half lines long. The *lateral line* runs parallel to the curvature of the back and is distant from the belly: it is marked by a tubular elevation on each scale.

COLOUR.—*Back* and *sides* dark, with a faint longitudinal streak through the centre of each row of scales. *Belly* yellowish white.

DIMENSIONS  
Of the prepared specimen.

	Inches.	Lines.		Inches.	Lines.
Length from the tip of the upper-jaw to extremity of caudal . . . . .	17	4½	Length of pectorals . . . . .	2	7
"    "    end of scales on ditto . . . . .	15	2	"    ventrals . . . . .	2	3
"    "    end of anal fin . . . . .	11	5	"    attachment of first dorsal . . . . .	1	8
"    "    anus . . . . .	9	3	"    third or highest spine of ditto . . . . .	1	4
"    "    first spine of second dorsal . . . . .	8	2	"    attachment of second dorsal . . . . .	2	6
"    "    first spine of first dorsal . . . . .	5	8½	"    its middle soft rays . . . . .	2	3
"    "    tip of suboperculum . . . . .	4	7½	"    attachment of anal . . . . .	2	2
"    "    end of scales on forehead . . . . .	2	1	"    its middle rays . . . . .	2	0
"    "    anterior margin of orbit . . . . .	1	3	"    lateral rays of caudal . . . . .	3	3
"    of intermaxillary . . . . .	2	0	"    between anal and base of caudal . . . . .	3	0
"    labial . . . . .	2	3	"    from end of scales to tip of lateral caudal rays . . . . .	2	8½
Breadth of ditto at lower end . . . . .	0	9	"    "    central ditto . . . . .	2	2
Length of lower-jaw to its articulation . . . . .	3	1	Diameter of orbit . . . . .	0	8

[4.] 1. LABRAX NOTATUS. (Smith.) *The Bar-fish, or Canadian Basse.*

FAMILY, Percoidæ. GENUS, Labrax, CUVIER.  
Labrax notatus. Lieutenant-Colonel C. H. SMITH. Mss.

The genus *Labrax*, or Basse, belongs to the same section of THORACIC PERCOIDÆ with *Perca*, from which it is distinguished by scaly gill-covers that terminate in a double spinous point, the want of denticulations on the sub-orbitars, subopercula, and interopercula, but principally by parts of the tongue being rough like a file with a crowd of extremely small teeth. Cuvier remarks, that the Basse has so close an affinity to the genus *Perca*, that it might be termed *Sea-perch* with more propriety than *Serranus*, which has much less resemblance to the perches in

organization. The common Basse of Europe (*L. lupus*) spawns in bays of the sea, preferring those into which rivulets of fresh water flow; but it occasionally ascends rivers, and the *lupi* of the Tiber, taken between the two bridges, were in vogue, at some periods, with the epicures of ancient Rome\*. The Rock-fish, or Striped Basse (*L. lineatus*) of New York, frequents the coasts of that state all the year; but, as Dr. Mitchill informs us, "the greatest run is in the fall. Instead of going away on the approach of winter, the Striped Basse seeks refuge in bays, ponds, and recesses, where he may remain *warm* and quiet. Here the fishermen find him and make great hauls during the coldest season, when many are brought to market in a frozen state." The dread of cold was ascribed, by the ancients, also to the *lupus*, and Cuvier thinks that their opinion is founded on facts; but I should judge that the Striped Basse, at least, seeks quiet rather than warmth, by quitting the sea in winter, for in northern climates the temperature of the ocean exceeds that of shallow bays or rivers in the winter-time. Had Dr. Mitchill observed that the Basse resorted to the southern states in greater numbers, or launched out into the Gulf-stream, in the cold season, we might have attributed its movements to a love of a higher temperature; but if its change of residence be not owing to its food being more abundant in the bays and rivers at the periods of its resort to them, it probably arises simply from the fact, that it prefers still-water to the turbulent waves of the ocean, excited by frequent storms. Cuvier has stated the matter more simply, and perhaps more correctly, in saying that this fish ascends rivers in the spring to *spawn*, and in the winter for the sake of *shelter*. I do not know how high up the St. Lawrence the Bar-fish goes, but the river ceases to be salt far below Quebec, where the fish is taken. Many of the *lupi* are covered with brown spots, and these were noticed by Cuvier to be females: it would be interesting to know if the different sexes of the American Basses have peculiar markings. The *L. notatus* derives its name from the resemblance of its spotting to musical characters. Lieutenant-Colonel Smith has obligingly furnished me with the following note respecting it.

"The Bar-fish of the Canadians at Quebec differs from Mitchill's Basse (*L. lineatus*, Cuv.), in being much more robust, and in being marked with rows of spots, five above and five below the lateral line, so regularly interrupted and transposed as to appear like ancient church-music. The *back* is brilliant with iridescent green, gold, and pink colours: the *sides* silvery. *Head* covered with strong scales. On the *lateral line*, which is quite straight, I reckoned fifty-eight scales."

"FINS.—D 9/ — 1/12; P. ?; V. 1/6; A. 1/12; C. 17." (Smith in lit.)

\* Vide *Hist. des Poiss.*, ii., p. 59.

The *lupus*, which the *L. lineatus* closely resembles in structure, contains seventy scales in a row, between the gill-opening and caudal-fin. The most remarkable character of *L. notatus* appears to be the solitary spine in the anal, all the other species having three. As to the six soft rays of the ventrals, the same number is represented in Mitchill's plate of *lineatus*, while Cuvier reckons only five, in conformity with the division of Percoidæ to which the genus belongs; but it often happens that the last ray is divided to the base, thus causing six to appear in the recent fish, though in the dried specimen, or skeleton, the exact number is easily ascertained by counting the joints. *L. lineatus* has eight or nine longitudinal streaks on a side, one of them corresponding to the lateral line. In the more robust form, and in the strong scales of the head, the Canadian Bar-fish resembles the *L. mucronatus* of the United States and the West Indies, and the *L. multilineatus* of the Wabash. The latter species has sixteen narrow, black, longitudinal lines on the flanks. Nothing is said of the habits of the latter; but if it ascends the Wabash in the winter time, it must have quitted the warm climate of the Gulf of Mexico, and its movements might in that case be ascribed, by some, to its love of cold or temperate waters. *L. notatus* is the most northern known American species, and if it frequents no higher latitudes than the Gulf of St. Lawrence, or the 50th parallel, its range northward is about equal to that of the *L. lupus*, which has been noticed on the southern shores only of Britain, though but rarely.

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[5.] 1. LUCIO-PERCA AMERICANA. (Cuvier.) *The American Sandre.*

FAMILY, Percoidæ. GENUS, Lucio-perca, CUVIER.

Le Sandre d'Amérique (*Lucio-perca Americana*), CUV. et VAL., ii., p. 122, pl. xvi.

Picarel. SETTLERS ON LAKE HURON.

The genus *Lucio-perca* also belongs to that division of THORACIC PERCOIDÆ having seven branchiostegous rays and two dorsals, but it stands in a subdivision which is characterized by the presence of long canine teeth, in addition to the ordinary ones "*en velours*." The species of this genus, like those of *Perca*\* as restricted by Cuvier, are probably all inhabitants of fresh-water exclusively, for though a *L. marina* of the Black Sea is noticed in the *Histoire des Poissons*, it is included in this genus with doubt, being known to Cuvier only by the description

\* *Perca-trutta* of the *Hist. des Poiss.*, which was caught in Cook's Straits, New Zealand, is afterwards described as a *Centroprius*, and will, Cuvier thinks, prove to be the type of a peculiar genus. It is not said whether *P. Plumeri* and *P. marginata* were taken in the sea or not; all the rest are fresh-water species.

given of it by Pallas, who considered it to be a *Labrax*. Exclusive of this uncertain species, there are three others which are each peculiar to a separate quarter of the Northern hemisphere. The European one, *L. sandra*, is found in the rivers and lakes of the north-east parts of that quarter of the world, and in the rivers that fall into the Caspian, being, however, unknown in Great Britain, France, and Italy. In this species there are no scales on the cheeks, lower part of the operculum, or suboperculum, and the preoperculum is the only piece of the gill-cover that is dentated, or shows spinous points. The vomer is armed only with teeth "*en velours*," and there are one hundred and twenty scales in a row between the gill-openings and the caudal-fin. The Asiatic species (*L. volgensis*) inhabits the rivers and lakes which flow into the Caspian Sea, has smaller and less unequal teeth than the preceding, but larger scales, there being only ninety in a longitudinal row. The cheeks and the gill-covers, with the exception of the suboperculum, and the limb and lower edge of the preoperculum, are covered with small scales. The *L. Americana* differs remarkably from these two in the tip of its bony operculum, being a sharp point or spine, showing, as Cuvier observes, that this sort of arming furnishes a character of very secondary importance. Other distinctive marks will appear in the detailed description which follows. The specimen described in the *Histoire des Poissons* was procured by M. Milbert from the fresh-waters of New York, but no account is given of its habits: ours is from Lake Huron, and was prepared by Mr. Todd at Penetanguishene. This gentleman states that it spawns in April and May, when it collects in numbers about the mouths of rivers. It takes a hook readily, and its flesh is white, firm, and wholesome.

## DESCRIPTION

Of a dried Lake Huron specimen, identified by Cuvier.

**FORM**—lengthened. The profile of the back is straight from the shoulder to the second dorsal, it then inclines slightly towards the tail, but also in a straight line\*. The *anus* is under the fifth and sixth rays of the second dorsal, and just posterior to the middle point, between the gill-opening and base of the caudal. The centre between the tip of the snout and end of the lateral line is under the eleventh ray of the first dorsal. **Head.**—The inclination of the forehead equals the sloping upwards of the under-jaw, thus giving a conical profile to the head, its apex formed by the extremities of both jaws being obtuse. The *orbit* is large and oval, and is placed once and a half the length of its axis behind the tip of the upper-jaw, and three lengths from the apex of the gill-cover. Each *labial* is composed of a single strong bone without any supplementary piece: it is dilated towards its extremity, and its under edge curves round the tip of the intermaxillary: it does not reach quite so far back as

\* Mr. Todd states the body to be "roundish and thicker upon the back, but sharper about the belly." The reverse of this is indicated by the section represented in the *Hist. des Poiss.*



the articulation of the lower-jaw, or posterior margin of the orbit, which are opposite to each other. The *anterior suborbital* is marked by five or six flat ridges radiating from a centre, which, when the soft parts are dried up, appear as denticulations on the edge of the bone.

GILL-COVERS.—The *preoperculum* has the form of a thin crescent, with its ascending limb very slightly undulated but entire, and its lower edge deeply serrated, producing six or seven coarse teeth slightly directed forwards. There are some scarcely perceptible crenatures on the edge of the *interoperculum*. The *operculum* and *suboperculum* together form an equilateral spherical triangle. The former ends in a pretty strong flat spine, which is the extremity of a thin, though strong ridge, that strengthens the bone internally, but is even with the surface above; the edge of the bone above the spine is cut away by a deep sloping notch, whose upper corner is a thin acute point, situated half an inch behind the tip of the spine, and an inch above and behind the membranous apex of the gill-cover: the under edge of the operculum forms a slightly convex perfectly even line. The *suboperculum* has, also, an even edge, which is bordered by a membranous flap that extends beyond the spine of the operculum and conceals it. The notch of this bone is also covered by the soft parts. The *supra-scapular*, *scapular*, and *humeral* bones are devoid of the slightest indentation or crenature\*; they are also scaleless, but the edge of the upper one is a little waved, and projects slightly on the side of the nape. There are irregular patches of small scales on the posterior part of the frontal bone, the temples, cheeks, operculum, and suboperculum; the posterior margins of the latter pieces, the whole interoperculum, and the head between and anterior to the orbits, are covered with smooth skin.

TEETH.—The *intermaxillaries* are armed posteriorly with a single, close, even row of very short curved teeth, with, on each side of the snout, a long, strong canine tooth, whose point fits into a depression of the lower-jaw; and on the extremity of the jaw, between the canines, there are five or six smaller conical teeth. On the *under-jaw* and edges of the *palate-bones* there is also a row of minute, crowded teeth, and just within them a series of large teeth, similar, and mostly equal in size, to the upper canines: each limb of the lower-jaw contains about twelve of these, and each palate-bone eight: they stand, generally, about the breadth of their bases apart from each other, but the lower canines, or foremost pair on the lower-jaw, are separated by a wider space from those behind, and shut in just anteriorly to the upper canines. The first pair on the palate (one tooth on each bone) is the largest of all. The transverse extremity of the *vomer* is injured in our specimen, but it appears to have been furnished with small teeth in the middle, and with one larger one on each angle, of which the sockets remain, and are as wide as the sockets of the lateral teeth of the palate †. The vault of the palate is smooth. The *tongue* has been cut away.

\* In the fig. in *Hist. des Poissons* they are serrated.

† In the *Hist. des Poiss.*, this species is simply said to resemble the European Sandre in its dentition. The teeth of the latter are thus described:—"Les mâchoires sont garnies d'une bande très-étroite de dents en velours, parmi lesquelles il y en a un rang de coniques et pointues encore assez petites à la mâchoire supérieure, et déjà plus grandes à l'inférieure et aux palatins: deux de ces dents aiguës en avant à la mâchoire supérieure, quatre à l'inférieure, et deux en avant de chaque palatin plus grandes encore que les autres, forment de véritables canines; mais à la ligne transversale du vomer il n'y en a que de petites en velours. La langue n'en a point, elle est libre et douce. Celles des pharyngiens sont en cardes."

FINS.—*Br.* 7; *D.* 14/ — 1/21; *P.* 13; *V.* 1/5; *A.* 1/13; *C.* 1744.

The *first dorsal* is arched and contains fourteen spinous rays. In our specimen the third, fourth, and seventh are the longest, the fifth and sixth, though acute, being rather shorter, probably from their growth having been accidentally impeded: the first stands over the tip of the gill-cover and insertion of the pectorals, and is not half so high as the third, but longer than the thirteenth, and twice as long as the fourteenth. The *second dorsal* commences an inch, or seven scales breadth, posterior to the membranous termination of the first, or to the middle point between the end of the snout and tips of the caudal: its rays are longest from the third to the seventh, the posterior ones becoming gradually shorter: the first is very short and appears to be spinous, the two next are simple but articulated, and the remainder are branched at their summits: the twenty-two rays are supported by twenty-one interspinous bones. The *anal* terminates opposite to the nineteenth ray of the second dorsal: three or four scales are interposed betwixt it and the anus: its spinous ray is very short and closely applied to the second, which also appears, at first sight, to be spinous, but its articulations are perceptible through a lens\*. The *ventrals* are situated a very little posterior to the pectorals, and contain five thick articulated rays, with a spinous one closely applied to the lower half of the first. Caudal slightly crescentic at the extremity, composed of seventeen rays, with eleven additional short ones at the base above and below.

SCALES.—The scales are of a form approaching to semi-orbicular, but more or less oblique; a narrow border round the uncovered portion is rough, with little crowded points sensible to the touch, but which require the aid of a lens to render them visible; the truncated base is marked irregularly with a variable number of crenatures corresponding to faintly impressed, nearly parallel streaks. There are ninety scales on the lateral line †, and forty in a vertical row just behind the ventrals—eleven of them above the lateral line. The latter is almost perfectly straight, and is on a level with the upper edge of the gill-cover. The scales above it are not only smaller than those on the sides, but also more closely tiled, so as to appear much smaller when in situ; they are also rounder with much less obliquity. The ordinary scales terminate on the base of the caudal by a semicircular outline, and there are also some very small ones on the membrane beyond, extending farthest between the outer rays. A scale from the back measures two lines and three quarters, both in length and breadth. On the sides they are about three lines and a half wide by three lines long. A linear inch measured on the sides includes seven scales; on the back there are nine or ten in an inch.

COLOUR.—Mr. Todd describes the back as dark, the sides dark yellow, and the belly whitish. In the dried skin the scales, as low as the lateral line, appear blackish-green, with very narrow pale exterior margins. On the sides the dark colour is confined more to the base of each scale, producing an obscure reticulation. There is a black patch on the membrane of the three posterior rays, and traces of dark clouding on other parts of the fin, particularly behind the first ray.

\* Cuvier marks the rays of this fin 2/11, but our specimen shows the above very distinctly. The second dorsal is also marked 1/20 by him.

† Between each pair of scales proper to the lateral line, the edges of two adjoining scales intervene and overlap. There are one hundred and twelve scales in the row immediately beneath the lateral line.



		DIMENSIONS.			
		Inches.	Lines.		
Length from tip of nose to extremities of				Length of lower-jaw	Inches. Lines.
caudal fin . . . . .	23	6		pectorals . . . . .	3 5
" " end of scales on central rays			"	ventrals . . . . .	2 10
" " of ditto . . . . .	20	9	"	longest rays of first dorsal	2 7
" " end of second dorsal . . . . .	17	2	"	attachment of ditto . . . . .	5 10
" " end of anal . . . . .	16	4	"	longest rays of second dorsal	2 2
" " anus . . . . .	14	0	"	posterior rays of ditto . . . . .	1 0
" " end of membrane of first			"	attachment of ditto . . . . .	4 6
" " dorsal . . . . .	11	9	"	longest rays of anal . . . . .	2 3
" " first spine of ditto . . . . .	6	3	"	posterior ray of ditto . . . . .	0 11
" " tip of gill-cover . . . . .	6	2	"	attachment of ditto . . . . .	2 3
" " anterior margin of orbit . . . . .	1	8	"	lobes of caudal . . . . .	3 6
" " of axis of orbit . . . . .	1	1	"	central rays of ditto . . . . .	1 10
" " one intermaxillary . . . . .	2	4		Depth of caudal fork . . . . .	0 10
" " one labial . . . . .	2	3			

### THE OKOW, or HORN-FISH\*.

The Okow inhabits the rivers and lakes of the fur countries up to the fifty-eighth parallel, and is, in all probability, the same species with the *L. Americana*. Specimens that I prepared at Cumberland-house, in 1820, would have enabled me to decide this matter, but, as I have mentioned in the preface, they have been accidentally destroyed; and on referring to my original notes of the characters of the recent fish, I perceive a few discrepancies betwixt them and the description in a preceding page of *L. Americana*, particularly in the position of the anus being under the commencement of the second dorsal, and not under its fifth ray. As the notes in question, though carefully drawn up, were my first attempt at ichthyological description, I do not found much upon them, but I deem it safer to place them before the reader, rather than to run the hazard, on the one hand, of creating a nominal species, or, on the other, of confounding two together, and thus producing an error in our account of their geographical distribution and habits. My notes, moreover, contain an account of the *viscera*, which is omitted in the *Histoire des Poissons*.

The Okow spawns in May, soon after the ice breaks up. At that period, and during the summer months, it is taken abundantly in gill-nets; but as it is seldom or never seen in the winter, it very probably passes that season in the deepest recesses of the lake. It is a well-flavoured, delicate fish, though, being too poor to

\* *Perca fluviatilis*, var.?? RICH. *Fr. Journ.*, p. 725, An. 1823.  
Okow, CREES. *Picarel*, or *Dorè*, CANADIANS. Horn-fish, FUR-TRADERS.

please the palates of those who have been accustomed to feast upon the White-fish (*Coregonus albus*), Mathemeg (*Pimelodus borealis*), or Sturgeon, it is very often abandoned to the dogs, with whom, for the same reason, it is no favourite. Even an Epicurean ichthyophagist would relish it when fried; but from the scarcity of lard, butter, or suet, this is not an usual mode of cooking in the fur-countries.

## DESCRIPTION

Of recent specimens taken in Pine-Island Lake, lat. 54°, May, 1820.

**COLOUR.**—*Back* and *sides* greenish-grey alternating in small spots with king's yellow: *belly* whitish. *First dorsal* beautifully streaked and clouded with different shades of yellowish-brown, and marked on the three posterior rays by a dark patch of venous-blood red. The *second dorsal*, the *pectoral*, and *caudal* fins are coloured and dotted like the back, the lower tip of the caudal being, however, whitish. The *ventrals* and *anal* are white, the latter also tinged with red, and both marbled with king's yellow. The top of the *head* is coloured like the back, and the cheeks present some shades of light cherry-red. The *irides* are lilac-purple, streaked with pearl-white, and the *inside* of the *mouth* is bluish-white, with a coating of nacre shining through in patches. The *scales* are rough on their exterior edges.

**FORM.**—*Body* compressed and oblong; the back sinks slightly at the end of the first dorsal, and the *lateral line*, which is parallel to it, has a corresponding depression. *Anus* situated rather before the commencement of the posterior third of the fish, exclusive of the caudal.

**Head.**—When the jaws are closed, the profile of the head is a cone, whose apex, including the tips of both mandibles, is rather obtuse. The anterior *nasal openings* have small opercular margins, shaped like the ear of a mouse, and placed so as to catch the stream of water when the fish moves forwards. The *eyes* are large and prominent. The *mouth* is rather large, its gape extending backwards with a curve downwards as far as the centre of the orbit. The *jaws* are equal in length, the somewhat pointed extremity of the lower one fitting into a depression formed in the more obtuse upper one.

**TEETH.**—The two largest teeth of the upper-jaw project one on each side of the snout, like the canine teeth of some quadrupeds, and are visible when the mouth is shut: they stand on the *intermaxillaries*, which are further armed with small teeth in a single crowded row. The *lower-jaw* presents, on each limb, a series of teeth like the upper canines, set rather widely, and the intervals are occupied by minute ones. The edges of the palate-bones, and the transverse ridge of the vomer, are armed like the lower-jaw. All the long conical teeth are very acute and have their points inclined backwards. The *tongue* is smooth, has a triangular form, and its tip is free, or projects considerably into the mouth. The three inner *branchial arches* are set with a double row of tubercles covered with small teeth; the outer arch has one row of tubercles, and also a row of rakers half an inch long, armed on their interior surfaces with a multitude of hook-shaped teeth. The *superior* and *inferior pharyngeal bones* are likewise rough with innumerable minute teeth.

**GILL-COVERS.**—The *preoperculum* has a prominent semicircular edge, which is armed with irregular tooth-like processes. The rest of the gill-cover is triangular, its apex being a mem-

branous flap. The *operculum* is armed with a spine which scarcely projects through the skin, and also with three smaller points, visible only when the skin dries. The *interoperculum* and *suboperculum* are unarmed, and the latter is terminated by the membranous tip of the gill-cover. The *supra-scapular* is rough with a projecting edge, and the *humeral bones* have also a prominent edge which is toothed. There are various patches of scales on the top of the head, cheeks, and gill-covers, and the frontal bone exhibits several furrows through the thin integuments. The *Branchiostegous membranes* overlap each other at their insertion into the isthmus, and contain seven cylindrical curved rays.

FINS.—*Br.* 7; *D.* 15/—21 or 22; *P.* 14 or 15; *V.* 1/5; *A.* 1/12; *C.* 16 or 18.

The *first dorsal* has fifteen spinous rays. The *second*, commencing an inch behind the termination of the other and over the anus, contains twenty-one or twenty-two rays. The *caudal fin* is crescentic at its extremity, and is partially scaly towards the base.

#### VISCERA.

On laying open the abdomen the *liver* appears lying transversely on the stomach and *cæca*: a triangular flap hangs from its centre, but it is not otherwise divided. The *bile* is pale; the duct of the *gall-bladder* opens into one of the *cæca*. The *œsophagus* is distinguished internally from the stomach by its longitudinal folds: it is short, and before it is slit open appears to be continuous with the first intestine, the stomach looking like a little bag attached to the side of the canal. The lining of the stomach has a light red colour, and being more ample than the exterior coats, is disposed in large crowded and convoluted folds: the *pylorus* is near the cardiac orifice, the greater part of the stomach being a blind sac. About an inch below the pylorus *three cæca*\* open into the intestine, which they equal in calibre. Their structure is similar to that of the intestine, consisting of a peritoneal coat with longitudinal fatty bands, a muscular coat with longitudinal fibres, a firm gelatinous coat, much thicker than the others, and an internal lining disposed in very minute folds. The *intestine* makes two convolutions, in the second of which its coats become gradually thinner and its calibre less, until it terminates in the rectum by a circular projection or valve. The *rectum* is short, and its diameter is equal to that of the gut near the stomach. The *spleen* lies in the first duplicature of the intestine. The *air-bladder* is forked at its upper end, and a small duct, proceeding from its middle, *terminates in the same cæcum with the gall-duct* †. There are a number of red-coloured fatty substances attached to the lining of the air-bladder.

\* *L. sandra* has four *cæca*.

† This passage stands so in my notes. I acknowledge that my dissections being carried on in cold weather, and in an apartment into which the light was admitted through a small parchment window, I may have mistaken a fold of peritoneum, or a band of vessels, for a duct. But if the duct really terminates in the *cæcum*, it seems to furnish an argument against M. Agassiz's opinion of the air-bladder being an organ of respiration, almost equally strong with that derived from the entire absence of that viscus in many fish.

## DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Total length including caudal fin . . . . .	22	0	Length of alimentary canal from pharynx to		
Distance between snout and caudal . . . . .	19	0	anus . . . . .	20	0
"                  "          anus . . . . .	12	0	"  from pharynx to pylorus . . . . .	2	0
Height of first dorsal . . . . .	2	6	"          pylorus to orifices of cœca . . . . .	0	9
Length of attachment of ditto . . . . .	5	0	"          "          valve of rectum . . . . .	16	0
Height of second dorsal . . . . .	2	0	"          of rectum . . . . .	2	0
Length of attachment of ditto . . . . .	4	0			
Depth of anal fin . . . . .	2	0			
Length of its attachment . . . . .	2	0			
"          ventrals . . . . .	3	0			
"          pectorals . . . . .	3	0			

Lieutenant-Colonel C. Hamilton Smith made a drawing at Quebec of a *Lucio-perca* which has some of the peculiar characters of the Okow, and which he thinks is either a marked variety of *L. Americana*, or a distinct species. "It is known by the name of *Poisson doré*. The specimen was fourteen inches long, its anus situated exactly beneath the first spinous ray of the second dorsal, and the fourteenth ray of that fin opposite to the termination of the anal. The colour of the fish was deep gold-yellow, with the black mottles running irregularly and obliquely downwards from the back towards the belly and tail, being quite in a contrary direction to the streaks represented in the figure of *L. Americana*, in the *Histoire des Poissons*. There is a black spot behind the first ray, there is another before the last of the anterior dorsal, and there are five longitudinal streaks on the second dorsal, but none on the caudal or ventrals. No *spine* was observed on the gill-plates." (SMITH *in lit.*)

[6.] 2. LUCIO-PERCA? CANADENSIS. (Smith.) *Canadian Sandre*.

*Lucio-perca Canadensis*, C. H. SMITH. GRIFF. *Cuvier*, x., Pl. 1, p. 275.

This fish, well-known at Quebec under the name of "Green pickering," is very different from any described species of *Lucio-perca*, so much so, that we are ready to join with its discoverer in suspecting that it may prove to be the type of a peculiar genus. In *L. Americana* the under margin of the bony operculum is perfectly even; but in the Green pickering it is armed with four remarkable, acute spines, similar to the one that terminates its point, and nearly as large. The *preoperculum* appears to have no serratures that show through the soft parts. The *first dorsal* commences with a strong spine, which is higher than the succeeding ones,

and stands farther back than the corresponding spine of *L. Americana*. The *second dorsal* resembles the anterior one in its first ray, which is spinous, being the highest, the succeeding articulated ones gradually diminishing in altitude. The two fins are equal in height, while in *L. Americana* the posterior one is lowest. In profile, the resemblance of the Green pickering to the Sandres is pretty close, but it presents a very dissimilar section of the body. Lieutenant-Colonel Smith remarks, that it has a strong similarity in form to the *Aspro vulgaris*, though it cannot rank in the same genus, as its dentition is totally different, nor does its likeness to that fish extend to the form of its jaws and caudal. We have been favoured with the following extract from Lieutenant-Colonel Smith's original notes respecting this interesting species.

"The specimen was caught at Quebec in the month of October, and measured about fourteen inches in length. The *back* was broad and flattish, its breadth nearly equalling the depth of the body. The *gape* large, extending to the eyes; the *teeth* strong, obtuse and standing singly. *Nostrils* double. Edge of the *gill-plate* armed with a row of five spines, which do not extend beyond the bordering membrane. *Head* scaly and the body rough, and stiff with very small scales. The two *dorsals* have an interval between them, and the first is marked with three rows of large, round, black spots; the second with four streaks of the same colour: the *tail* is lunate, with a half-black bar on the upper and lower rays:—these three fins, together with the *pectorals*, having a yellow ground colour. The *anal*, commencing under the seventh ray of the second dorsal, is ochre-yellow: the *ventrals* are rounded and have a bright orange tint. The *irides* are black with a golden ring. The upper part of the *body* is dark olive-green, the lower whitish, joining the black by a waving line: there are a few pale yellow spots below the lateral line which curves downwards.

"FINS.—*P.* 12; *V.* 1/5; *D.* 12/ — 1/17; *A.* 12; *C.* 17." (SMITH *in lit.*)

[7.] 1. CENTRARCHUS ÆNEUS. (Cuvier.) *Bronzed Centrarchus.*

FAMILY, Percoidæ. GENUS, Centrarchus. CUV. ET VAL., t. vii., p. 456.

Cichla ænea, LE SUEUR. *Jour. de Sc. Phil.*, ii., p. 214. An. 1822.

Le centrarchus bronzé (*Centrarchus æneus*). CUV. ET VAL., iii., p. 84, Pl. 48.

PLATE LXXV.

This fish inhabits Lakes Huron, Ontario, and Erie, frequenting, during the summer months, shady places, under high banks or shelving rocks. It preys upon cray-fish, worms, and the larvæ of coleoptera, and is very voracious, not sparing the young even of its own species. Our specimen, which was procured at Penetanguishene, was submitted to the inspection of Baron Cuvier, who made the fol-

lowing remark upon it. "*Cychla ænea* de Le Sueur, *Centrarchus æneus*, NOB." Since that period, however, the seventh volume of the *Histoire des Poissons* has appeared, wherein the genus *Centrarchus* is revised by M. Valenciennes, and some changes made in the specific names, in consequence of many more specimens having been sent to him from various parts of the United States. In the third volume it is said, "Les centrarchus ont le corps ovale, comprimé, un dorsale unique, des dents en velours au machoires, au-devant du vomer, aux palatins et sur les bases de la langue; le préopercule entier; l'angle de l'opercule divisé en deux pointes plates. Nous les avons nommés centrarchus ou anus épineux, à cause du nombre assez considérable des épines de leur anale, qui va à cinq ou six, tandis que dans la plupart des genres voisins il n'est que de trois." In the seventh volume this character is modified as follows:—"Nous avons vu deux espèces de centrarchus qui n'ont que trois épines à l'anale, comme c'est l'ordinaire chez le plus grand nombre des acanthoptérygiens; mais ce genre n'est pas moins facile cependant à reconnaître par l'absence de dentelures au préopercule et surtout parce que des dents en velours ras existent sur les palatins, le vomer et la base de la langue." (p. 456.) *Bryttus* is distinguished from the preceding genus solely by the want of teeth on the tongue; and *Pomotis* is known from both by the tongue and palate being smooth, the preoperculum slightly toothed, and the operculum ending in a rounded, membranous ear-like lobe. Some of these characters\*, so far from being of generic importance, will scarcely serve to distinguish species; and it will be seen, by the description given below, that our specimen of *Centrarchus æneus* has the preoperculum distinctly serrated or denticulated. It appears, therefore, to us, that it would be more convenient and better to re-unite the three genera into one, which will stand in the division of Thoracic Percoideæ having five soft rays in the pectorals; fewer than seven branchiostegous rays; only one dorsal; and no canine teeth.

On comparing our Lake Huron specimen of *Centrarchus æneus* with the description of the species in the *Histoire des Poissons*, the only discrepancies are, that there the anal is said to commence opposite to the sixth dorsal spine, while in Le Sueur's original figure, as well as in our specimen, it begins opposite to the tenth; no notice is taken by the Baron of the singular oval plate of teeth on the centre of each palate-bone, and he says, "c'est à peine si l'on peut dire qu'il y a une dentelure au préopercule." The edge of the preoperculum, in our specimen,

\* Even the character of teeth on the palate is of little importance as a generic distinction in some families of fish. See *Thymallus signifer*, which resembles the Common Grayling very closely in its general form, but differs from it in having palatine teeth.

has been cleared by insects, and the serratures are very evident; while the description in the *Histoire des Poissons* was taken, most probably, from fish preserved in spirits, and, consequently, with the soft parts entire. Le Sueur also describes the gill-covers as without spines or denticulations. The Baron states the scales to be "*striées en éventail, à huit crénelures;*" whereas we observe fourteen or more crenatures. M. Le Sueur's figure represents a more elongated fish than our specimen. I have been particular in noting these minute and apparently trivial differences, because of the following passage in the *Histoire des Poissons*, which requires that the species of the individual we have to describe should be determined with the greatest possible precision.

"*Le centrarchus que nous désignons sous le nom de sparøide (t. iii., p. 88, et pl. 48,) c'est trouvé parmi les poissons recueillis dans l'expédition si hardie du Capitaine Franklin. Il avait été pêché dans le lac Huron : les naturels le donnèrent au Docteur Richardson sous le nom anglais de 'rock basse.' Nous avons reconnu que cette espèce n'est pas le véritable labre sparøide de M. de Lacépède ; ainsi nous l'appellerons le centrarchus à six épines (centrarchus hexacanthus, Nob.), et nous reporterons le nom de sparøide à l'espèce qui nous est récemment parvenu et qui a, comme le dessin original de M. Bosc l'indique, neuf épines à l'anale.*" A mistake has here occurred as to the origin of the specimen now called *C. hexacanthus*, which was not procured by us, but was very likely sent by M. Le Sueur from the Wabash (see *Hist. des Poiss.*, t. iii., p. 88). The only one we saw is the one described at length below, and which, as I have mentioned above, was labelled *C. æneus* by the Baron himself: it was then returned to us, and could not have been examined by M. Valenciennes in his revision of the genus. *C. hexacanthus* is readily distinguished, not only by having but six dorsal spines, but also by the great length of the soft portion of the anal, and many other particulars which will at once appear on comparing our figure with t. xlvi. in the *Hist. des Poiss.* M. Le Sueur's original name of *nigro-maculatus* might have been retained instead of the new one of *hexacanthus*, had it not been applicable to most species of the genus.

#### DESCRIPTION

Of a dried specimen from Lake Huron.

FORM.—*Body* short and much compressed: its *profile* oval, the back, however, more arched than the belly, with a short strap-shaped tail issuing immediately behind the dorsal and anal fins; the profile descends in a rapid curve from the dorsal to the snout, with a slight gibbosity between the orbits. The *length*, excluding the caudal fin, is a little more than twice the *height* of the body at the fore part of the dorsal, where it is greatest.

The HEAD measures a little less than one-third of the total length, including the caudal fin, and is twice the length of the tail, from the anal to the end of the scales. *Eyes* large and rather prominent, placed about a diameter of their orbits apart from each other, the same distance from the tip of the upper jaw, and also from the articulation of the lower one, and two diameters from the tip of the gill-covers \*. The *infra-orbital bones* form an irregular, uneven plate before the orbit, but merely a narrow margin beneath it. The *cheeks* are rather large, and are entirely covered with scales. The *snout* is short and obtuse. The *mouth*, when closed, descends obliquely towards the articulation of the lower jaw, which is opposite to the centre of the orbit: its orifice commences in the axis of the pectoral fins, and is about twice as much below the ridge of the back, as it is above the rim of the belly. The *inter-maxillaries* form the whole upper margin of the mouth. The *labials* project more than half their length from under the anterior infra-orbital plate, are strong, become gradually wider towards their lower ends, which are truncated and cover the corners of the mouth. The *under jaw* has a little depth vertically at its extremity, forming a kind of chin when the mouth is closed: there are five orifices in each limb of the bone communicating with an internal canal, two of the holes on each side of the chin being connected with pores in the recent specimen. The two jaws, the snout anterior to the centre of the orbits, the infra-orbital bones, the labials, preoperculum, some ridges and margins of the other opercular pieces, and the branchiostegous membrane, are covered with smooth skin, but the rest of the head is scaly.

TEETH small, short, not very acute, but numerous and crowded like velvet pile (*en velours ras*) into stripes or plates, which cover the edges of the *jaws* and *chevron* of the *vomer* to the breadth of a line. The outer edges of the *palate-bones* are covered by a narrower band of rather shorter teeth, and there is an oval patch of them, a quarter of an inch long, near the middles of these bones. Our specimen has lost the tongue.

GILL-COVERS.—*Preoperculum* having its upper limb ascending vertically, nearly at a right angle to the lower one, which is shorter and wider. The anterior edge of the bone is elevated, its surface is uneven, and its inferior margin is very regularly and distinctly denticulated with fine grooves running upwards from between the teeth. In the recent specimen these are concealed by the smooth skin. The *interoperculum* has a row of scales along its upper border, which are partially covered by the serrated edge of the preoperculum: the under part of the bone, exceeding the scales in breadth, is smooth with an even edge. The *suboperculum* is very small and of a triangular form: its upper angle is covered by two small scales; its lower border is smooth. The *operculum*, forming by far the largest part of the gill-cover, is also triangular, its posterior apex terminating in two thin lobes or plates separated by an acute notch: the upper of these plates is truncated; the lower one projects farther, is more acute, and is slightly jagged, or obscurely crenated on its under edge—these plates are edged with a membrane which lengthens them out and alters their form a little, at the same time concealing the crenatures. The anterior border of the operculum is raised into an even smooth ridge, which has a row of three scales between it and the slightly-overlying edge of the preoperculum.

\* The eye is considerably larger than in the *Pomotis* described in a subsequent page.



The posterior flat points or plates are also covered with smooth skin, but the bordering membrane, and all the rest of the operculum, are scaly. The *supra-scapular*, and bones lining the posterior margin of the gill-openings, are smooth and toothless.

The SCALES have their exterior edges forming a segment of a circle, their sides parallel, and their bases truncated: exteriorly they are smooth to the naked eye, but under a lens their surfaces and edges are covered with minute teeth: on the covered bases there are diverging furrows with fourteen corresponding crenatures of the edge: the size of the scales is greatest on the sides, smaller on the back, belly, and tail, and smallest on the head, particularly the cheeks: they cover the occiput, terminating between the eyes. One from the sides is nearly five lines wide, and rather more than four lines long. The *lateral line* follows the curve of the back at the distance of an inch. It contains forty-three or forty-four scales, and there are forty in a longitudinal row on a line with the tip of the gill-cover. A vertical row under the beginning of the dorsal contains twenty-one scales.

FINS.—*Br.* 6; *D.* 11/11; *A.* 6/10; *P.* 14; *V.* 1/5; *C.* 16 $\frac{1}{2}$ .

The *dorsal* commences a little behind the base of the pectorals, and just anterior to the tip of the operculum: its eleven anterior rays are spinous, very acute, and gradually increase in height from the first, which measures four lines to the sixth, which is nine lines in height: the soft rays are an inch and a quarter long, and the outline of that part of the fin is rounded. There are three interspinous bones anterior to the first dorsal spine, but no vestige of rays belonging to them. The *ventrals* stand opposite to the third dorsal spine; and the *anal*, beginning opposite to the tenth, contains six strong, tapering, and very acute spines, the fifth of which, being the longest, measures nearly an inch: the soft part of the fin is one inch and a half deep, and is rounded—three or four of its rays are posterior to the last ray of the dorsal. The *caudal* is very slightly two-lobed, unless when spread to the utmost, when it is almost even: its length equals the part of the tail behind the dorsal, or constitutes one-sixth of the total length of the fish. The bases of the caudal, dorsal, and anal, are scaly for a short space.

COLOUR.—Not having had an opportunity of examining a recent specimen, I am indebted to Mr. Todd for the following description of the colours:—"Back dark; sides honey-yellow, with a quadrangular black mark on the base of each scale, sometimes including the tip of the overlying scale. These marks are most distinct on the sides, where they form rows." M. Le Sueur says, "The general colour is brilliant coppery, with irregular spots of a blackish-brown, and olive upon the back, the head, and opercula; the jaws, lips, and throat are black; thorax bluish-grey: these colours, which are very beautiful during life, disappear when it dies, and become of a bluish-grey, brown, or black; lateral scales with their base and extremity black, so as by their junction they produce the lines of black spots which ornament this fish. *Pectoral, ventral, and anal fins* marbled with reddish-brown and blue; the anal and dorsal have a black border with their bases dark brown, the rays distinguished by their light colour; the soft part of the dorsal is maculated with small irregular spots. *Pupil* dark blue; iris red and black."

## DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from tip of snout to extremities of caudal fin . . . . .	9	0	Length of lower jaw to its articulation with the preoperculum . . . . .	1	4
" " end of scales on caudal . . . . .	7	10	" attachment of whole dorsal . . . . .	3	8½
" " anus . . . . .	4	2	" " spinous part of ditto . . . . .	2	4
" " beginning of anal . . . . .	4	9½	" highest dorsal spine . . . . .	0	9
" " first soft ray of anal . . . . .	5	7	" " soft rays . . . . .	1	4
" " last ditto, ditto . . . . .	6	3½	" attachment of anal . . . . .	2	1
" " beginning of dorsal . . . . .	3	4	" " of soft rays of ditto . . . . .	1	0
" " first soft ray of ditto . . . . .	5	5	" soft rays of anal . . . . .	1	5
" " last ditto, ditto . . . . .	6	2	" pectorals . . . . .	1	6
" " orbit . . . . .	0	8	" ventrals . . . . .	1	5
" " tip of gill-cover . . . . .	2	8	" caudal from scales on longest rays . . . . .	1	6
" of chin to ditto . . . . .	2	11	" ditto from origin of longest rays . . . . .	1	10
" orbit . . . . .	0	8	" central rays of caudal from their base . . . . .	1	6
" vertical diameter of orbit . . . . .	0	7½	Greatest height of body . . . . .	3	8
" intermaxillary . . . . .	1	0	Vertical diameter of tail . . . . .	1	0
" labial . . . . .	1	0	Distance between anus and first anal spine . . . . .	0	6

M. Le Sueur has described, in the Journal of the Philadelphia Academy of Sciences, two Lake Erie fish, which he associates with his *Cichla ænea*, the *Centrarchus æneus* of the preceding article. The presence of palatine teeth excludes them from *Pomotis*, but as he does not mention whether the tongue be toothed or not, nor the presence of serratures on the preoperculum, it is impossible to say whether they belong to *Centrarchus* or *Bryttus*, or even to the same group. We abridge M. Le Sueur's descriptions. His first species resembles *Pomotis Catesbei* (Cuv. et Val.) in the streaks on the gill-covers, but differs from it in its palatine teeth, and from all the species of the group described in the *Histoire des Poissons*, in its transverse bands on the sides.

## CICHLA FASCIATA. (Le Sueur.)

FORM.—*Body* compressed, tapering at the two extremities, three and a half times as long as the head, by one length in depth. *Head* narrow, scaleless between the eyes and upon the snout, which is short. *Jaws* large, truncated posteriorly, *intermaxillary* long and narrow. *Inferior jaw* hardly longer than the superior one, mandible strong, enlarged, spoon-shaped.

TEETH very small, numerous, card-like on the *jaws*, *palate*, and extremity of the *vomer*.

FINS.—*Br.* 6; *P.* 18 to 20; *V.* 5; *D.* 10/15; *A.* 3/12; *C.* 17<sup>3</sup>.

*Dorsal fin* high, rounded behind, arched before, and very low at its junction with the soft part. *Anal* rounded shorter than the soft part of the dorsal. *Caudal* slightly emarginated with rounded lobes.

SCALES rounded, not toothed, rather irregularly placed, large on the sides, smaller on the back, small on the back of the neck, very small under the belly, on throat and cheek, and a

little larger on the preoperculum and suboperculum; there are also very small ones between the rays of the anal and caudal fins. *Lateral line* undulated, oblique.

COLOUR general brownish-olivaceous, deep and fuliginous on the *back*, lighter on the *sides*, the middle of the *scales* brown, the margins black; *anal fin* greenish, the posterior part of the *dorsal* and *caudal* violaceous, *abdomen* and *throat* bluish and violaceous, thirteen, fourteen, or fifteen transverse brown bands on the side, a little deeper than the general tint; the *opercula* are also traversed with many olivaceous bands. When the fish dies the colour changes, and is then sometimes all blue or black, and the bands disappear.

LENGTH eighteen or twenty inches. It is one of the best fishes in Lake Erie, and is salted. It is taken at all seasons of the year by the seine or hook and line.

#### CICHLA MINIMA. (Le Sueur.)

FORM.—*Body* very long, sub-compressed, elevated before the dorsal. *Head* arched, very large. *Eye* very large. *Teeth* very small in many ranges on the jaws and palate. *Mouth* large.

SCALES very small. *Lateral line* straight in the middle of the body. COLOUR deep grey, tinted with bluish on the *back*, with metallic reflexions on the *sides* and *abdomen*, and with points, or small black and brown spots on the *abdomen* and *back*, and a spot on the *neck*.

FINS.—*Br.* ?; *D.* 9/14; *P.* ?; *V.* ? *A* 3/10; *C.* 17 to 18.

*Dorsal fin* long, divided into two equal parts, the anterior of spinous rays much lower than the soft part, which is rounded. *Anal* large, equal to the posterior part of the dorsal. *Pectorals* large, placed very low near the operculum. *Ventrals* much smaller than the pectorals, and placed exactly beneath them. *Caudal* subtruncated.

LENGTH nine lines. Lives in the small lagoons of tranquil water which discharge by narrow channels into Lake Erie.

#### [8.] 1. POMOTIS VULGARIS. *Northern Pomotis.*

FAMILY, Percoides. GENUS, Pomotis. VAL. *Hist. des Poiss.*, vii. p. 454.

#### PLATE LXXVI.

This fish frequents the sheltered inlets of Lake Huron and the ponds in that vicinity, concealing itself, in the summer time, beneath the broad leaves of the nuphar and water-lily\*, where it may be readily taken with a hook baited with a small fish or worm. I found fragments of fresh-water shells (*helix*, *planorbis*, *limneus*, &c.) in the stomachs of several individuals which I examined. In the third volume of the *Histoire des Poissons*, Baron Cuvier referred a number of specimens which

\* Catesby says of the species he detected in Carolina, the original of the *Labrus auritus*, Linn., that it covers itself with mud or sand, and is therefore called "ground-perch."

he had received from various parts of North America to a species which he designated *vulgaris*, and our Lake Huron ones were examined among the rest and returned to us under that appellation. As has been mentioned, however, in the preceding pages, M. Valenciennes found it necessary, on receiving an additional number of good examples from different localities, to distribute them into several species, and to revise the characters of the genus *Pomotis*, of *Centrarchus*, so closely allied to it, and to constitute an intermediate genus, which he named *Bryttus*. He says, " *Les pomotis seront ceux des poissons de ce groupe qui auront quelques dentelures plus ou moins marquées au bord du préopercule, les palatins et la langue lisses et sans dents. Ils n'ont de dents que sur le chevron du vomer. Le nombre des rayons épineux de l'anale ne sera plus qu'un caractère secondaire ; car nous avons déjà parlé d'un pomotis qui a quatre épines à cette nageoire.*" The den- tition furnishes, in fact, the only means pointed out of distinguishing these three genera \*, for we have already seen that our specimen of the *Centrarchus æneus* has its preoperculum as conspicuously denticulated as the *Pomotis vulgaris* figured in the *Histoire des Poissons*, though the latter is described by the Baron as displaying this character more distinctly than its congeners. On the other hand, the *pomotis* described below, has the denticulations very slight indeed, and in one specimen scarcely perceptible. Our Lake Huron examples also want the crenatures of the upper humeral bone, represented in the *Histoire des Poissons* (t. xlix.); their bodies are more nearly orbicular in profile, the greatest depth equalling the distance between the preoperculum and the posterior part of the dorsal and anal fins; the ventrals are under the third or fourth dorsal spine, while in the figure referred to they are opposite to the first spine of the dorsal, and the numbers of the scales differ as well as the rays of the fins. These discrepancies were perhaps sufficient to have authorised me to give a new specific name to the Lake Huron fish which appears to be the most northern of the genus, but our figure was engraved previous to the publication of M. Valenciennes' revision of the genus under the name by which Cuvier had himself labelled the specimen, and I have therefore, for the present, continued to it the appellation of *vulgaris*. Correct and minute descriptions of recent specimens are particularly necessary to complete our knowledge of this group of *Percoideæ*, owing to the rapidity with which the fish composing it lose their brilliant colours after death. M. Valenciennes describes his *P. vulgaris* as having no coloured streaks on the cheeks, and this, if there be no mistake,

\* In the operculum ending by two points, and in the smallness of the suboperculum, *C. æneus* differs remarkably from our *P. vulgaris*, whose operculum ends in a round lobe, and the suboperculum is prolonged so as to form the under margin of the gill-cover. We do not know how far these characters prevail in other species.

would at once distinguish ours ; but his observations necessarily relate to specimens preserved in spirits, and his correspondents may readily have committed errors in their accounts of species so similar to each other. His *Pomotis Catesbei* “ *se distingue de toutes les autres par les lignes brunes et obliques des joues,*” but its form is lengthened. In ours the side of the head is ornamented by alternate wavy lines of azure blue and gall-stone yellow. I have to remark, that my account of the colours was noted down after comparing the fresh specimen with Syme’s book of colours, but that the artist, having no other guide than my brief description, has fallen far short of the beauty of the original tints and markings. Our figure, however, does every justice to the form of the fish, and agrees minutely with the measurement of the specimen, in which no traces remained of the original brilliant colouring. Mr. Todd was informed by the natives, that many small land-locked lakes or ponds, in the vicinity of Lake Huron, contain no fish whatever but the *Perca fluviatilis* and this *pomotis*.

## DESCRIPTION

Of a recent specimen taken at Penetanguishene, April 20, 1825.

**COLOUR.**—*Back* and *sides* for a short space below the lateral line blackish-green, thickly interspersed with ill-defined, roundish spots of deep bluish-grey and gall-stone yellow (one on the middle of each scale), and also with some obscure tints of indigo-blue. On the *cheeks* and *gill-covers* the blue tints are brighter, approaching to azure, and are disposed in longitudinal wavy lines alternating with gall-stone yellow. The *lower parts* of the *sides* are lighter than the back, and exhibit some greenish reflections with larger and more distinct roundish spots of yellow. The *belly* presents the pure gall-stone yellow without spots. On the *tip* of the *gill-cover* there is a large bluish-black spot, edged posteriorly with bright scarlet. The *irides* are silvery shaded with yellow.

**FORM.**—*Profile* broadly oval, the anterior apex rather acute and formed by the lower jaw, which projects slightly beyond the upper one: the posterior apex of the oval is lost immediately behind the dorsal and anal fins in the slightly tapering tail, whose height is one-third of that of the body. The *height* of the *body* is greatest at the fourth or fifth dorsal spine, where it measures three inches and three quarters, and the long axis of the oval, from the chin to the setting-on of the tail, is five inches and a half. The height is to the whole length, excluding the caudal fin, as 3·7 to 7\*. The *body* is much compressed; its greatest thickness is on a level with the tip of the gill-cover, or in the middle of the height, and does not exceed an inch: the ridge of the back is acute, the belly is obtuse, being nearly an inch broad. The *lateral line* is arched, gradually though slightly approaching the back as it recedes from the operculum, until it arrives opposite to the posterior part of the dorsal fin: it is there broken by two or three successive descents of a scale’s breadth each, and afterwards takes a straight course along the middle of the tail: it is marked out by a tube on the basal half of each scale.

\* In *P. vulgaris* (C. et V., vii., p. 465) “ *sa hauteur fait la moitié de sa longueur, la caudale non comprise.*”

The SCALES adhere firmly to the skin and are rather large. On the sides and tail there is no great difference in their sizes; on the gill-covers, though more rounded, they are nearly as large, but the cheeks, ridge of the back, and flattened surface of the belly, are covered with smaller scales; while the smallest of all are on the bases of the fins and on the membrane connecting their soft rays. The form of the scales is the segment of an oval approaching to a semicircle—their bases are very evenly truncated, and are marked with fifteen or sixteen faint furrows or lines, corresponding to minute crenatures of the margin—the rest of their surface appears rough under the lens, particularly towards their exterior semicircular margins. A scale taken from the side measures four lines longitudinally, and five transversely. A linear inch, measured on the side on a line level with the tip of the gill-cover, contains nearly eight scales, and there are thirty-eight in all, in that row, exclusive of four or five small ones on the caudal fin; there are forty-two or forty-three on the lateral line, also excluding the latter. At the greatest depth of the body there are twenty-two scales in a vertical row, of which six are above the lateral line, and twelve between it and the first ray of the ventral, with three scales for the half breadth of the belly.

HEAD small, forming one-third of the length of the fish, excluding the caudal fin. The scales of the nape terminate on a line with the posterior edge of the orbits; the rest of the upper surface of the head, the infra-orbital bones, the mandibles, the preoperculum, the inferior margins of the other bones of the gill-cover, and also the anterior ridge and ear-like tip of the operculum, and the branchiostegous membrane, are smooth; the other parts of the gill-cover and the cheeks are scaly. All the bones lining the gill-openings posteriorly, and those supporting the pectoral fins, are without serratures on their edges: the anterior surface of the latter is covered by a row of scales. The *orbits*, exactly circular, are close to the forehead, and more than their own diameter above the articulation of the lower jaw, one diameter from the tip of the snout, and two from the tip of the gill-cover. The anterior infra-orbital bone is rather large, has a rhomboidal shape, with the lower angle rounded off, and is marked with irregular ridges and furrows. The *nostrils*, situated in the angle between the eye and snout, have their two orifices rather distant from each other. The *mouth* is small: the *intermaxillaries*, forming its upper border and attached to the snout by pedicels, are capable of a slight protrusion. The *labials*, proportionably much smaller than in *Centrarchus œneus*, slide under the sub-orbital bone, leaving only a fourth part uncovered. The *lower jaw* shuts in before the intermaxillaries, giving the commissure of the mouth nearly an angle of 45°. The articulation of the jaw is opposite to the anterior margin of the orbit. There are no *pores* on the lower jaw, though there is a canal in the bone with two orifices covered by skin.

TEETH.—The opposing surfaces of both mandibles are covered with small teeth crowded closely together; the outer ones are nearly cylindrical and rather obtuse, the inner ones more awl-shaped, slender, and acute. The *vomer* forms a strong, horse-shoe shaped projection, chevron, or gorget, and is armed like the jaws. The *palatine bones* and tongue are smooth. On the *upper pharyngeal bones* there is a pair of triangular plates of teeth “*en pavé*?” there being forty or fifty cylindrical teeth with flat crowns in each triangle; behind which there is a pair of smaller irregular plates of more minute teeth. On the *inferior pharyngeal bones*

there is one pair of rectangular plates of teeth similar to the anterior plates above, and, like them, larger than the teeth on the jaws. The *branchial arches* are each furnished with a pair of rows of very small tubercles, which are rough with teeth so minute as to be invisible to the naked eye.

**GILL-COVERS.**—The upper limb of the *preoperculum*, descending almost vertically, terminates by a curve in the lower one, whose inferior border is scarcely crenated, being only slightly and minutely undulated. The *interoperculum* has a row of scales adjoining the overlying border of the preoperculum, the largest scale being opposite to the angle of that bone. The *suboperculum*, instead of being small and triangular, as in *centrarchus æneus*, is long, and is attached to the whole under edge of the operculum: it is covered by a row of scales which leave a narrow under border naked. The *operculum* is triangular with the posterior apex rounded: in the recent specimen this rounded tip is lengthened out by membrane into the coloured ear-like appendix from whence the generic name is derived. The anterior margin of the operculum rises into a smooth ridge, between the lower end of which and the angle of the preoperculum there are two scales, being a continuation of the row which exists on the interoperculum. The under margin of the operculum also forms a smooth line betwixt the scales on its surface and the row covering the suboperculum.

**FINS.**—*Br.* 6—6; *D.* 10/12\*; *P.* 13; *V.* 1/5; *A.* 3/10; *C.* 17½.

The *branchiostegous rays* are considerably curved; the posterior one is flattened, the others are nearly cylindrical. The *dorsal fin* commences opposite to the tip of the gill-cover and base of the pectorals: the ten spinous rays occupy nearly one-third more space than the twelve articulated ones, but the latter are considerably higher. Three *interspinous* bones without rays fill up the space between the first dorsal spine and the thin, elevated occipital crest which supports the ridge of the nape. The *first ray* of the *pectorals* is spinous, though as slender as the others; it is about half the length of the longest soft ray. The *ventrals* attached opposite to the fourth dorsal spine consist of five articulated rays, supported anteriorly by a moderately stout spinous one one-third shorter. The *anal fin* commences a quarter of an inch behind the anus, and terminates opposite to the last dorsal ray: its three first rays are strong, somewhat compressed, awl-shaped acute spines, of which the third is twice the length of the first, but scarcely half as long as the articulated rays that follow: the outline of the fin is rounded. The *caudal fin* is slightly sinuated at the extremity with rounded lobes. Small scales cover its outer rays two-thirds of their length, but they extend only a short way on the central rays.

#### INTESTINES.

*Stomach* a roundish sack bent up on the œsophagus and having its internal coat longitudinally plaited: the *pylorus* is wide, and is surrounded by a collar of six cylindrical, obtuse *cæca* each an inch long. The *gut* is a cylindrical tube bent twice upon itself between the pylorus and anus: its coats, like those of the stomach, are rather thick, and its lining also forms longitudinal folds.

\* Another specimen has only eleven soft rays, but it has an additional short spine at the beginning of the fin.

## DIMENSIONS

Of the Lake Huron specimen.

		Inches.	Lines.			Inches.	Lines.
Length from tip of lower jaw to end of caudal fin . . . . .		8	6	Length of longest dorsal spine . . . . .		1	0
" " upper jaw (protruded) to end of scales on middle caudal rays . . . . .		7	0	" " soft rays of dorsal . . . . .		1	4
" " anus . . . . .		4	6	" " pectorals . . . . .		2	0
" " anal fin . . . . .		4	9	" " first spinous ray of ditto . . . . .		0	10½
" " dorsal . . . . .		3	0	" " spine of ventrals . . . . .		1	0
" " orbit . . . . .		0	7½	" " soft rays of ditto . . . . .		1	6
" " tip of gill-cover . . . . .		2	5	" " attachment of anal . . . . .		1	5
" " chin to ditto . . . . .		2	7	" " third anal spine . . . . .		0	11
" and breadth of orbit . . . . .		0	6½	" " soft rays of anal . . . . .		1	4
" of intermaxillary . . . . .		0	8½	" " longest caudal rays . . . . .		1	3
" labial . . . . .		0	8½	" " central ditto . . . . .		1	5
" lower jaw . . . . .		0	11	" " tail from behind dorsal and anal fins to base of caudal . . . . .		1	8
" attachment of dorsal . . . . .		3	5	" " to extremity of ditto . . . . .		3	0
" " of spinous part of ditto . . . . .		2	½	Greatest height of body . . . . .		3	9
				Diameter of tail, vertically, at base of caudal . . . . .		0	11

[9.] 1. TRICHODON STELLERI. (Cuvier.) *Steller's Trichodon.*

FAMILY, Percoides. GENUS, Trichodon. CUVIER.

" *Trachinus trichodon.* PALL., *Zoogr.*, t. iii., p. 235." TILESIIUS, *Mém. de Pétersb.*, iv., p. 466, Pl. 15, f. 8. An. 1813.Le trichodon de Steller (*Trichodon Stelleri*). CUV. et VAL., iii., p. 154.

ANAMCHLYK. ALEUTIANS.

The genus *Trichodon*, first indicated by the unfortunate Steller, stands in Cuvier's system among the *Thoracic Percoides*, which have five soft rays in the pectorals, fewer than seven branchiostegous rays, and two dorsals. Pallas and Tilesius, suppressing Steller's genus, ranged the only known species as a *Trachinus*, or Weever; but the Weevers in the Baron's scheme of arrangement are Jugular Percoides, and have besides the operculum armed with a remarkable spine; while in *Trichodon* that bone ends in a flat point, and the preoperculum is armed with four or five strong spines. The lateral direction of the eyes distinguishes *Trichodon* from another genus of the same division with the Weevers, namely, *Uranoscopus*, to which its flat head and vertical mouth give it a resemblance. The position of its ventrals again under the pectorals, and the want of scales, seem to ally it to *Cottus*; but its cheeks are not mailed by the sub-orbitars, which form only a narrow border to the orbit.

The only *Trichodon* hitherto discovered inhabits the most northern part of the Pacific, being found both on the American and Kamtschatdale coasts, and abounding particularly at Unalashka. It resembles the Weevers in its habits, buries itself in the moist sands at low water, and is dug up by the natives with their



hands. The females deposit their roes in holes in the sand, where the males fecundate them, and it would appear that the parents look after their offspring, as they are often dug up in the same pits with their little ones.

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We shall conclude our notices of the PERCOIDÆ with some general observations on their GEOGRAPHICAL DISTRIBUTION. Previous to the appearance of the *Histoire des Poissons* such an attempt would have been entirely futile, and even that splendid memorial of Cuvier's transcendent genius, a model for works on Natural History, does not afford all the data we require, but is to be considered as merely a frame-work to be filled up by future observers. It contains five hundred species of this family, three hundred and twenty-seven of which, or about two-thirds of the whole, are inhabitants of the Indian Ocean and warmer latitudes of the Pacific: forty-nine frequent the eastern side of the Atlantic (including the Mediterranean), and one hundred and eighteen have been detected on the American side of that sea, the greater part of them within the tropics. Few of the Percoideæ attain high latitudes. *Perca vulgaris*, one of the most northern, exists in the Siberian rivers which fall into the Icy Sea; *Lucio-perca sandra*, *Acerina vulgaris*, and *Trachinus draco*, are found as high as Sweden; and *Labrax lupus*\* reaches the Danish coast. In the New World the *Lucio-perca Americana* (or rather the Okow, if it be a distinct species) is the only one that has a range northward at all approaching to these †, for in America the true perches are not so arctic as the Sandre, though in Europe they are more so. Eight other percoid fish, described in the preceding pages of this Fauna, inhabit the St. Lawrence, or the Great Lakes from which that river issues, but none of them go to the north of the fiftieth parallel, while the Okow extends to the fifty-eighth. One species of *perca* is found in Patagonia, and *Trichodon Stelleri* inhabits the sea of Kamtschatka, stretching over to Russian America.

Before speaking more particularly of the distribution of forms, or the range of species, it is advisable that we should enumerate the *fresh-water genera*, though the line of division betwixt them and the oceanic ones cannot be drawn with precision, because some genera, composed mostly of fresh-water species, contain one or two which exclusively inhabit the ocean ‡; or, on the contrary, a marine genus

\* In page 10 the southern shores of Britain are assigned as the northern limit of the range of this species, on the authority of the *Hist. des Poissons*; but Professor Reinhardt enumerates it among the Danish fishes, in a paper recently read before the Natural History Society of Copenhagen.

† The Okow does not, however, exist in the rivers that flow into the Polar Sea.

‡ All the East-Indian *Dules* inhabit the fresh waters, but the two American species are found in the Caribbean sea.

may include one or more fresh-water species \*. Even the species cannot be strictly arranged as belonging to salt or fresh-water, several that habitually reside in rivers or lakes occasionally straying to the sea or into tidal waters †; while of the marine species, some are regularly anadromous, ascending the rivers every season to spawn, others quit the sea occasionally, only, entering the fresh waters in quest of food or shelter at uncertain periods ‡. Allowing for these cases, then, fourteen of the sixty genera which compose the family may be said to belong to the fresh waters, namely, *Aspro* and *Acerina* peculiar to Europe; *Huro*, *Grystes*, *Aphrodederus*, *Bryttus*, *Pomotis*, and *Centrarchus*, found in North America §; and *Ambassis*, *Aphrites*, and *Dules*, belonging to the East Indies. *Perca* has species in Europe, Asia, the Indian Archipelago, North America, and in the West Indies; *Lucio-perca* has one representative in Europe, another in Asia, and a third in North America; and *Grystes* has one species in the rivers of Carolina and Georgia, and another in the Macquarrie of New Holland. *Lates* may be considered either as a fresh-water or marine genus, one species existing in the rivers of Northern and Tropical Africa, and two others in the sea and rivers of the East Indies ||. It may be gathered from the preceding paragraphs, that in temperate climates the majority of percoideæ are found in rivers or lakes, while within the tropics there is a vast preponderance of marine species.

After the above cursory review of the fresh-water genera, an equally compendious notice of the marine ones, that are common to various districts of the ocean, will enable us to single out the *genera* or modifications of the percoid form, which have the *widest distribution*. *Serranus* (which includes a fourth part of all the species in the family) is much more common within the tropics than elsewhere, but it is known in the Mediterranean, on the Atlantic coasts of Europe, Africa, and of North and South America, in the Red Sea, the Indian Ocean, Polynesia, and sea of Japan, though not on the American side of the Pacific. *Labrax*, which contains only seven species (some of which are littoral or even ascend into fresh waters), is also widely diffused, having representatives in the Mediterranean, on the European, and North and South American coasts of the Atlantic, in Polynesia and the

\* Twenty species of *Apogon* are marine, while *A. thermalis* has the very extraordinary residence of warm fresh-water springs.

† *Perva vulgaris* has been taken in the Sulway firth, and is reported by Pallas to inhabit the Caspian Sea. *Lucio-perca sandra*, and the common pike, are also said by the same naturalist to remain in a bay of the Caspian even in the spawning season, without entering the neighbouring rivers, although there is no obstacle to their ascending them.

‡ As some species of *Labrax*, or Basse. *Centropomus* frequents the mouths of rivers.

§ Two of the genera are not exclusively North American. *Pomotis* has a Brazilian species, and *Centrarchus* a West-Indian one.

|| Lieutenant Allen found a *Lates* in the Niger, exactly resembling that of the Nile and Senegal, and Mr. Collie observed a species among the Loo Choo Islands.

northern Pacific, but none in the African Atlantic, Red Sea, or Indian Ocean. Ten other genera, containing one hundred and fifty-eight species, are common to the warmer latitudes of the Atlantic, Indian and Pacific Oceans, viz. : *Plectropoma*, *Mesoprion*, *Polyprion*, *Centropristis*, *Priacanthus*, *Myripristis*, *Holocentrum*, *Uranoscopus*, *Sphyræna*, and *Polynemus* \*. *Dules*, which we have already mentioned as an East-Indian fresh-water genus, is not exclusively so, as two species exist in the Caribbean Sea. *Pinguipes* has one species in the Brazilian Sea, and another in the sea of Chili. *Rypticus*, confined to the Tropical Atlantic, has one species peculiar to the Brazils, and another common to the Caribbean Sea and Cape Verd Islands. *Trachinus* has species in the Mediterranean, and also in the European Atlantic as far north as the Cattegat. The remaining genera are either peculiar to a single district of the ocean, or consist of only a solitary species each, and will be mentioned in the subsequent paragraphs.

We have next to notice a few facts respecting the *range of individual species*. It were to be wished that we could throw an additional interest into this inquiry, by pointing out the peculiarities of organization by which certain species are adapted to inhabit a variety of climates, while others thrive in very confined localities only ; but our acquaintance with the habits and anatomy of oceanic fish is by far too slight for such a task. One might be led *à priori* to imagine, that as the ocean affords, as it were, a high way so easily traversed by the finny tribes, many species would be common to both sides of the Atlantic, yet this is far from being the case. Not one of the percoideæ of European seas has hitherto been detected on the North American coasts, and there are but four which cross the Atlantic even in the warmer latitudes. These are *Holocentrum longipinne*, which has been taken on the coasts of Carolina, the West Indies, and South America, and also off the islands of Ascension and St. Helena : *Sphyræna picuda*, which occurs in the Gulf of Mexico, in the sea of Brazil, and at Goree, on the coast of Africa : *Polyprion cernuum*, which ranges from the Mediterranean to the Cape of Good Hope, crosses to the Rio de la Plata, and is found also at Queen Charlotte's islands in the Pacific : and lastly, *Rypticus saponaceus* which has been taken at Martinique and among the Cape Verd islands. Two species double Cape Horn, or at least they exist on both the Atlantic and Pacific sides of South America, namely, *Centropomus undecimalis*, which frequents the mouths of rivers in the West Indies, Brazils, and Peru : and *Bovichtus diacanthus*, which has been taken off Tristan d'Acunha and on the coast of Chili.

\* *Polynemus approximans* was observed by Mr. Collie on the coast of California. (App. Beechey's Voy., p. 57.)

One species may be supposed to travel round the Cape of Good Hope, viz., *Apogon rex-mullorum*, which exists in the Mediterranean, among the Canaries, in the Indian Ocean, at the Marian Islands, New Guinea, and New Holland, but has not hitherto been discovered in the American seas. It is, however, by no means certain that a species which is found on both sides of a continent, or at a succession of distant places, actually exists in the intermediate seas, or traverses them, for *Uranoscopus scaber* is common to the Mediterranean and Indian Ocean, without having been detected in the Atlantic; and there are species of other families which frequent the Mediterranean coasts of Egypt, as well as the Red Sea, though they are unknown in other districts of the ocean. The range of the *percoideæ*, and of many other *Acanthopterygii*, is much greater in the Indian Ocean and warmer parts of the Pacific than in the Atlantic. Thus species which exist in the Red Sea, at the Seychelle Islands, and the Mauritius, range by the Indian peninsula and archipelago to New Guinea, the north coast of New Holland, and through the Polynesian group to Otaheite, and even to the Sandwich Islands. A continuous coast, or a chain of islands lying nearly in the direction of the zones of equal temperature or parallels of latitude, seems to favour the spreading of a species over a great extent of ocean. The shores of the Atlantic, which have a direction the reverse of this, afford no such facilities to the migration of fish, the beds of sargasso, or sea-weed that occur in the lower latitudes being but an imperfect substitute for islands, and available to those fish only which feed on or near the surface.

Having made these very general remarks on the diffusion of the genera, and on the range of individual species, we have next briefly to notice the *forms peculiar to different quarters*. Europe has five genera proper to itself, *Aspro* and *Acerina*, inhabitants of fresh waters, and *Pomatomus*, *Trachinus* and *Paralepis* of the sea: add to these *Pentaceros*, frequenting the Cape Verd Islands, and *Apsilus* the Cape of Good Hope, and we have seven different forms, containing in the aggregate fifteen species peculiar to the east side of the Atlantic. The genera proper to North America all belong to the fresh waters, and are, *Huro*, *Aphrodederus*, *Bryttus*, *Centrarchus*, and *Pomotis*; while the Gulf of Mexico and Brazilian seas contain *Pinguipes* and *Percophis*, in all nine forms and twenty-one species peculiar to the American side of the Atlantic. *Centropomus* and *Bovichtus* are proper to South America, but they occur in both oceans. *Aplodactylus* is peculiar to the sea of Chili. *Trichodon* has been found in the Kamtschatdale Sea only, and *Niphon* nowhere but in the sea of Japan. The Red Sea, Indian Ocean, Polynesian and Australian seas, or the lands which they wash, contain twenty-three percoid genera, not known to exist in the Atlantic or its arms, the Mediterranean,

Black Sea, Baltic, and Hudson's Bay; nor in the Pacific north of the tropics. The following list of their names exhibits the number of species belonging to each, amounting in the aggregate to one hundred and thirty-one.

Etelis . . . . .	1	Priopis . . . . .	1	Therapon . . . . .	13	Rhynchichtys . . . . .	1
Enoplosus . . . . .	1	Grammistes . . . . .	2	Datnia . . . . .	3	Beryx . . . . .	3
Diploprion . . . . .	1	Diacope . . . . .	36	Pelates . . . . .	3	Trachichtys . . . . .	2
Apogon * . . . . .	20	Aprion . . . . .	1	Helotes . . . . .	1	Percis . . . . .	12
Cheilodipterus . . . . .	3	Cirrhites . . . . .	6	Nandus . . . . .	1	Aphritis . . . . .	1
Ambassis . . . . .	12	Chironemus . . . . .	1	Sillago . . . . .	7		

GENERA.	Caspian and its Rivers.	European Atlantic, &c.	Mediterranean and Black Sea.	African Atlantic.	West Indies and South American Atlantic.	North American Atlantic, &c.	North China and Japanese Seas.	Kamtschadale Seas and Behring's Straits.	Seas of Chili and Peru.	Tropical and South Pacific, Indian Ocean, and Red Sea.	Totals of Species.
Perca . . . . . F	1	1	2	0	2	5	0	0	0	2	11
Labrax . . . . . A	0	1	2	0	1	3	1	0	0	1	7
Lates . . . . . A	0	0	1	1	0	0	0	0	0	2	3
Centropomus . . . . .	0	0	0	0	1	0	0	0	1	0	1
Lucio-perca . . . . . F	2	1	1?	0	0	1	0	0	0	0	3 or 4
Huro . . . . . F	0	0	0	0	0	1	0	0	0	0	1
Nippon . . . . .	0	0	0	0	0	0	1	0	0	0	1
Apogon . . . . .	0	0	1	0	0	0	1	0	0	20	21
Pomatomus . . . . .	0	0	1	0	0	0	0	0	0	0	1
Aspro . . . . . F	0	0	2	0	0	0	0	0	0	0	2
Serranus . . . . .	0	2	6	7	31	2	3	0	0	85	131
Plectropoma . . . . .	0	0	0	0	5	0	1	0	0	9	15
Mesoprion . . . . . S and F	0	0	0	3	18	0	0	0	0	28	49
Acerina . . . . . F	1	1	2	0	0	0	0	0	0	0	3
Polyprion . . . . .	0	0	1	1	1	0	0	0	0	1	1
Pentaceros . . . . .	0	0	0	1	0	0	0	0	0	0	1
Centropristis . . . . .	0	0	0	0	4	2	1	0	0	3	10
Grystes . . . . . F	0	0	0	0	0	1	0	0	0	1	2
Apsilus . . . . .	0	0	0	1	0	0	0	0	0	0	1
Rypticus . . . . .	0	0	0	1	2	0	0	0	0	0	2
Aplodactylus . . . . .	0	0	0	0	0	0	0	0	1	0	1
Centrarchus . . . . . F	0	0	0	0	1	6	0	0	0	0	7
Pomotis . . . . . F	0	0	0	0	1	7	0	0	0	0	8
Bryttus . . . . . F	0	0	0	0	0	3	0	0	0	0	3
Aphrodederus . . . . . F	0	0	0	0	0	1	0	0	0	0	1
Priacanthus . . . . .	0	0	0	1	4	0	2	0	0	8	15
Dules . . . . . F	0	0	0	0	2 S.	0	0	0	0	9 F.	11
Trichodon . . . . .	0	0	0	0	0	0	0	1	0	0	1
Myripristes . . . . .	0	0	0	0	1	0	1	0	0	10	12
Holocentrum . . . . .	0	0	0	3	3	1	0	0	0	14	19
Trachinus . . . . .	0	2	4	0	0	0	0	0	0	0	4
Pinguipe . . . . .	0	0	0	0	1	0	0	0	1	0	2
Percophis . . . . .	0	0	0	0	1	0	0	0	0	0	1
Bovichtus . . . . .	0	0	0	0	1	0	0	0	1	0	1
Uranoscopus . . . . .	0	0	1	0	1	1	0	0	0	9	11
Sphyræna . . . . .	0	0	1	2	3	0	0	0	0	5	10
Parelepis . . . . .	0	0	3	0	0	0	0	0	0	0	3
Polynemus . . . . .	0	0	0	3	1	1	0	0	0	9	14
Gen. peculiar to India, &c.	0	0	0	0	0	0	0	0	0	111	111
	4	8	28	24	85	35	11	1	4	327	501

Obs. The letter F follows the names of the genera which are wholly or mostly inhabitants of fresh water. A points out those whose species are anadromous, ascending occasionally into rivers; and S signifies sea or marine species.

\* One species of *Apogon* is, as we have already mentioned, found in the Mediterranean as well as in the Indian Ocean.

The preceding table presents a general view of the diffusion of the Percoidæ. We have found it convenient to divide the ocean into nine districts, the divisions being made, as far as we could, to suit the distribution of this family of fish. To shorten the table, twenty-two genera peculiar to the Indian Ocean and tropical regions of the Pacific, enumerated above, are omitted, the aggregate number of their species merely being inserted. The fresh-water species are included under the head of the seas into which the rivers flow.

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Cuvier, considering the MULLI to have some relations to the Percoidæ, has placed them as an appendix to that family, though he says they constitute a perfectly natural genus, which is so isolated that it may be considered as a peculiar family in itself. The genus *Mullus* is distinguished from other groups of *Acanthopterygii* by two distinct dorsals; large and easily detached scales on the head and body; but principally by two barbels attached to the chin or symphysis of the lower jaw. The term *Mullus* is retained for a sub-genus which wants teeth on the upper jaw, and that of *Upeneus* is given to one which has teeth in both jaws. *Mullus*, in its geographical distribution, is confined to the Black Sea, Mediterranean, and European Atlantic, including the Baltic. *Upeneus* has twenty-seven species in the Red Sea, Indian Ocean, and Pacific\*, including the seas of Australia and Japan; four in the West Indies and Brazils, and one at the Cape Verd Islands, but none of either sub-genus belong to North America.

\* A new species of *Upeneus* is indicated in Mr. Bennett's Appendix to Beechey's Voyage, as occurring at Oahu, one of the Sandwich Islands.

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## COTTOIDEÆ.—MAILED-CHEEKS\*.

THIS family, having many characters in common with the Percoideæ, is distinguished by the sub-orbitars being united to the preoperculum, and so expanded as to cover a large part or the whole of the cheeks. A family likeness prevails among the fish possessing this cheek-mail, notwithstanding the various forms of the head, that result from its greater or less development. In one group of genera, the head has the form of a cube or parallelopiped; in another it is round or depressed; in a third it is compressed; and a fourth group is composed of fish of a hideous aspect, having a large or even monstrous head and vertical eyes. *Gasterosteus*, though belonging to this family, because it has the cheeks protected by the sub-orbitars, does not enter any of these four groups, there being neither spines nor tubercles on its head, nor anything very striking in its form: in this genus the first dorsal is replaced by free or detached spines. *Monocentris*, which has a large cuirassed head, and the whole body protected by scales of stony hardness, forms a genus apart, whose affinities, owing to our ignorance of its anatomy, are unknown: it resembles the *gasterostei* in its free dorsal spines. The percoid genus *Uranoscopus* approaches this family in the development of the sub-orbitars, but they are united to the temporal bone posteriorly, and not to the preoperculum.

The only forms among the *Cottoideæ* that have anything like a general distribution are the larger genera of *Trigla*, *Cottus*, *Aspidophorus*, *Scorpæna*, *Sebastes*, and *Gasterosteus*, containing the majority of the whole species. *Minous*, *Pterois*, *Apistes*, and *Synanceia*, belong to the Indian Ocean, a single species of each of the three latter extending to the Pacific. *Platycephalus* and *Pelor* are also genera of those seas, a greater proportion of their species, however, extending to the more temperate latitudes of the Pacific, three of the former existing on the extra-tropical coasts of New Holland, and four with one *Pelor* in the sea of Japan. The Japanese Sea also nourishes some forms peculiar to itself, as *Oplichthys*, *Bembras*, and *Monocentris*, and the sea of Kamtschatka alone produces *Blepsias* and *Hemilepidotus*. *Peristedion* is peculiar to the Mediterranean. The European Atlantic possesses no cottoid form exclusively; but on the American side, *Hemitripterus*

\* *Jones cuirassées*. (Reg. An.) Cuvier has not furnished us with a Latin equivalent to this phrase, which might be translated *Parcioplondæ* or *Parcioplitéæ*, (from *παριον*, *gena*, et *οπλα*, *scutum*, or *οπλαριος*, *armatus*;) but to avoid introducing a new term, I have used *Cottoideæ*, which will be readily understood, being derived from the most familiar genus of the family.

is widely spread in the higher northern latitudes, *Cephalacanthus* is proper to South America, and *Prionotus* is common to both these districts. The habitat of *Tenianotus* is unknown, and it is consequently scarce, and most probably found only in one locality. Of the twenty-five genera, therefore, which compose the family of Cottoideæ, sixteen are peculiar to certain limited portions of the ocean; and eight of the remainder have species in two or more distinct districts. *Hoplostethus* has one Mediterranean species, and the only known specimen of a second was taken from the stomach of a shark, caught in the Atlantic at some distance from the coast of South America. *Agriopus* has one species not uncommon off the Cape of Good Hope, and another in the sea of Chili. *Sebastes* has species in the Mediterranean, and also in the Atlantic, Indian, and Pacific oceans: this form, which approaches nearer to the Percoideæ than the other Cottoideæ, having a very general distribution. *Aspidophorus* has several species in the more northern latitudes of the Pacific, and on the European and American sides of the North Sea. The *Trigla* are known in the Mediterranean, on both sides of the northern Atlantic, at the Cape of Good Hope, in the Indian Ocean, the Australian Sea, and in the seas of Japan and Kamtschatka\*. *Cottus*, a genus either littoral or frequenting tidal estuaries, with some entirely fresh-water species, has a very wide distribution in the northern hemisphere, existing in the rivers and lakes of Europe, Asia, and America, in Lake Baikal, the Icy sea of Asia, the Baltic, the North Sea, English Channel, the seas of Iceland, Greenland, and Baffin's Bay, the Polar Sea, on the Atlantic and Pacific coasts of North America, and in the seas of Kamtschatka and Japan; but it is unknown in the Mediterranean and more southern districts of the ocean. *Scorpena*, again, is comparatively a tropical genus, most of its species being inhabitants either of the Red Sea, the Indian Ocean, and Archipelago, or of the Polynesian seas; it is known, however, also in the Mediterranean, in the Atlantic, on the European side from the English Channel to the Canaries, and on the American side from the United States to the Brazils; it bears, like its subgenus *Sebastes*, a close resemblance to the Percoideæ. *Gasterosteus*, consisting principally of anadromous species, has a wide range in the northern hemisphere, being found in the rivers of Europe, Greenland, and America, in the Baltic, both sides of the North Atlantic, and in the sea of Kamtschatka. A new species has even been detected at Otaheite by the naturalists of Captain Beechey's Expedition, though there is none mentioned in the *Histoire des Poissons*, as occurring in the southern hemisphere.

\* A species of *Trigla* is mentioned in the Appendix to Captain Beechey's Voyage, as occurring in the harbour of Rio Janeiro, but it was most probably a *Prionotus*, perhaps the *punctatus*, which is known to exist there.



The *range of individual species* is more remarkable in this family than in the more extensive one of Percoidæ, as is evident when we consider the number of species which cross the Atlantic, and in this respect there is some analogy between the *Cottoideæ* and some of the higher classes of animals, it having been observed that the quadrupeds and birds common to the Old and New Worlds are species that have a high northern range. *Trigla pini* exists in the Mediterranean, on the Atlantic coasts of France, and at New York. *Dactylopterus volitans* is common in all parts of the Mediterranean, and ranges on the American coast from the Brazils to the banks of Newfoundland, probably pursuing the course of the Gulf Stream. *Aspidophorus Europæus* is found in the Baltic, English Channel, the Iceland Sea, and Davis's Straits. *Scorpena porcus* ranges throughout the Mediterranean, and from the English Channel to the Canaries, and it also occurs at New York. *Sebastes Norvegicus* extends from the sea of Norway to that of Greenland and the Gulf of St. Lawrence. It seldom approaches the surface, living habitually at a great depth. *Gasterosteus leiurus*, which may be reckoned an anadromous fish, prevails all over Europe, and has been taken in the Baltic, and also in Greenland, if one of the very nearly resembling American species has not been, in the latter case, confounded with it. The *G. trachurus* has probably an equally extensive range. *Cottus gobio*, a fresh-water species known throughout Siberia, and in Europe from Italy to Sweden, is, according to Fabricius, also an inhabitant of Greenland; but we need careful comparisons to establish the identity of the Greenland species: our *C. cognatus*, which can scarcely be distinguished from *C. gobio*, inhabits Great Bear Lake. *C. quadricornis* is common to the Baltic, the icy Sea at the mouth of the Jenisei, and Lake Baikal. Besides some that have already been particularised, several *Cottoideæ* are common to the Mediterranean and Baltic, particularly of the genus *Trigla*, as *T. lineata*, *hirundo*, *lyra*, *gurnardus*, and *cuculus*; and also *Scorpena scrofa*. *Cottus scorpius*, *C. bubalus*, and *Gasterosteus Spinachia* are common to the Baltic and North Sea; while *Platycephalus fuscus* has an extensive range in the Pacific, being found at Port Jackson, Otaheite, and Japan.

But one specimen of the very singular genus *Oreosoma* has been seen. It was brought from the Atlantic by Péron. The cheeks are but very imperfectly covered by the sub-orbitars, hence it scarcely belongs to this family, though it appears to have a greater affinity to it than to any other.

GENERA.	Caspian Sea and Lake Baikal.	Asiatic Icy Sea.	European Atlantic.	Mediterranean and Black Sea.	African Atlantic.	Caribbean Sea and South American Atlantic.	North American Atlantic.	Greenland, Devil's Straits, Baffin Bay, and Polar Sea.	Bering's Straits, & Kamtschatala Sea, N. W. America.	Sea of Japan.	Polynesia, Indian Ocean, and Red Sea.	South Australian Sea.	Sea of Chili and Peru.	Totals of Species.
I. Trigla . . . .	0	0	7	8	4	0	1	0	0	0	5	1	0	15
Prionotus . . . .	0	0	0	0	0	1	3	0	0	0	0	0	0	4
Peristedion . . . .	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Dactylopterus . . . .	0	0	0	1	0	1	1	0	0	0	1	0	0	1
Cephalacanthus . . . .	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Cottus . . . .	2	1	4	0	0	0	3	5	10	1	0	0	0	22
Aspidophorus . . . .	0	0	1	0	0	0	0	2	6	5	0	0	0	9
II. Platycephalus . . . .	0	0	0	0	0	0	0	0	0	4	15	3	0	21
Oplichthys . . . .	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Hemitripteris . . . .	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Hemilepidotus . . . .	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Bembras . . . .	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Scorpena . . . .	0	0	3	2	1	5	1	0	0	1	12	0	1	20
Sebastes . . . .	0	0	1	1	2	0	1	1	1	3	3	0	0	11
III. Pterois . . . .	0	0	0	0	0	0	0	0	0	0	7	0	0	7
Tænianotus . . . .	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Blepsias . . . .	0	0	0	0	0	0	0	0	2	0	0	0	0	2
Agriopus . . . .	0	0	0	0	1	0	0	0	0	0	0	0	1	2
Apistes . . . .	0	0	0	0	0	0	0	0	0	0	13	1	0	14
Minous . . . .	0	0	0	0	0	0	0	0	0	0	2	0	0	2
IV. Pelor . . . .	0	0	0	0	0	0	0	0	0	1	4	0	0	5
Synanceia . . . .	0	0	0	0	0	0	0	0	0	1	5	0	0	6
Monocentris . . . .	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Hoplostethus . . . .	0	0	0	1	0	1	0	0	0	0	0	0	0	2
Gasterosteus . . . .	0	0	6	5	0	0	6	3	1	0	0	0	0	17
	2	1	22	19	8	9	17	11	21	19	67	5	2	168

TRIGLA, placed by Cuvier at the head of the family, is, in fact, the genus in which the sub-orbitars most completely cover the cheek, these bones being articulated anteriorly to the snout, projecting more or less beyond it, and united so firmly posteriorly to the preoperculum that it moves along with them. It belongs to the group having a parallelepipedon head and two dorsal fins, being, with its two sub-genera, distinguished from the rest of the group by the presence of free rays under the pectorals. The *Trigla*, as we have noticed in the preceding pages, have a wide range in the Mediterranean, and on the European side of the Atlantic, from the Canaries to Norway. One species, at least, ranges also to the American coast, for a *Trigla pini*, or one so like it that no distinguishing marks could be perceived in the prepared specimen, was sent to Baron Cuvier from New York; and as this species ranges on the European side as high as the Dutch coast, it is probable that it extends on the American one to Nova Scotia or Newfoundland; but until it has been actually detected on the coasts of British America, it would not be proper to enumerate it in our Fauna. The sub-genus *Prionotus*, distinguished by the presence of palatine teeth, *en velours*, belongs entirely to America, and though three of the four known species reach New York, yet their

range being to the Southern states, and some of them to the West Indies and Brazils, it is not so likely that they go northwards beyond the influence of the Gulf Stream.

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[10.] 1. DACTYLOPTERUS VOLITANS. (Lacep.) *Common Dactylopterus.*

FAMILY, "Joues cuirassées" GENUS, Dactylopterus. CUVIER.  
 Trigla volitans. LINN. Le Dactyloptere commun. CUV. et VAL., iv., p. 120.

The genus *Dactylopterus* differs from *Trigla* and its two sub-genera, *Prionotus* and *Peristedion*, in the different shape of the helmet-like casing of the head, which is long and broad, but flat and of small depth: the sub-orbitars do not project on the sides of the snout, neither do they entirely cover the cheeks, while the preoperculum is so connected with them, that instead of being entirely fixed, it retains sufficient mobility to point its enormous spine, when required, as a defensive weapon: the operculum is unarmed; the teeth confined to the jaws are small, rounded, and low, like paving stones ("dents en pavés"): there are only six branchiostegous rays; the ventral fins have only four soft rays (an unusually small number in Acanthopterygious fishes), and the supernumerary rays under the pectorals, instead of being free, are united by membrane into a kind of parachute equalling the body in length. The whole body is cased in large hard scales, which rise into longitudinal ridges in various parts.

The common species enters into our list as it occurs on the coasts of Newfoundland. It ranges also through the seas of the United States, and is particularly abundant in the Mediterranean, but does not appear to frequent the British Channel or the Atlantic coasts of France. A second species exists in the Indian Ocean and Archipelago.

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[11.] 1. COTTUS COGNATUS. (Richardson.) *Bear Lake Bull-head.*

FAMILY, "Joues cuirassées." GENUS, Cottus. LINN. et CUV.

The genus *Cottus* is characterised by a large depressed cuirassed head, variously armed with spines or tubercles, a more slender, tapering, almost naked body; two dorsals either quite distinct or very slightly united; ventrals of three or four rays

only under the pectorals; six branchiostegous rays; and teeth on the forepart of the vomer, but none on the palate bones. The stomach is an obtuse sac, the pylorus is surrounded by from four to eight cæca, the ovaries have a blackish colour, and there is no air-bladder belonging to the fish of this genus. *Platycephalus* differs from *Cottus* in having a still more depressed head, which is also differently cuirassed, large *abdominal* ventrals of five rays, a row of sharp palatine teeth, seven branchiostegous rays, and a scaly body.

The *Cottus* which forms the subject of this article was taken in considerable numbers in the clear waters of Great Bear Lake during the month of May, at which period it resorts to the stony shallows to spawn. Specimens which we sent to Baron Cuvier were returned with the remark, that they belonged to a species of *Cottus*, and were "*tres semblables aux C. gobio* \*," and they indeed correspond in most particulars with the extended description of the latter in the *Histoire des Poissons*. I have since compared these specimens minutely with an English *gobio*, kindly lent to me by Mr. Yarrell, and the principal difference that I have been able to detect in the American fish is the greater height of its dorsal and anal fins. There is also a discrepancy in the number of the rays, but this can scarcely be accounted a specific distinction, since different individuals of *gobio* show equally extensive variations. The Bear Lake specimens having been long in spirits have lost much of their colour, but the following particulars may still be noted. In *C. gobio* the rays of the pectorals are variegated with rings alternately dark and light; in *cognatus* the colour is almost uniform, but varies in intensity in different individuals. In one small female specimen of the latter, however, there is a slight indication of these rings, and its body likewise is marbled in a more lively manner than the rest, having a greater resemblance to *gobio*. The males are darker than the females in the American as well as the European species. The specimen which we have described in detail was the largest we obtained, and was selected for description from its being exactly of the same length with the *gobio* with which it was compared.

## DESCRIPTION

Of a *male* specimen taken in Great Bear Lake, lat.  $64\frac{1}{2}^{\circ}$  N., May 26, 1825, and a comparison of it with an English *C. gobio*.

FORM.—*Head* corresponding exactly with that of *gobio* in size and shape, except that the mouth is rather larger: it forms one-third of the whole length excluding the caudal, and it is

\* Cuvier, speaking of *C. minutus* of Pallas from the sea of Ochotak, says, "*Sa ressemblance avec l'espèce commune de nos eaux douces est telle que nous n'oserions l'en distinguer*," and I should have thought in a similar way of *C. cognatus*; but as Cuvier did not consider it to be the same with the common species, although greatly resembling it, it appears safer to give it a distinct appellation.

as broad as it is long: its height is two-thirds of its breadth. The *jaws* are equal. There are no conspicuous *spines* on the head, but the *preoperculum* ends posteriorly in a little point that is bent upwards, and is concealed in the thickness of the skin. The *operculum* terminates in a rounded process, whose membranous edging has two acute angles. There are six slender cylindrical rays in the *branchiostegous membrane*: in *gobio* the rays are stronger and flatter. The membranes can be inflated: the isthmus, or space between their insertions, measures half an inch. *Body* moderately compressed, and tapering gradually from the broader head to the caudal fin: its greatest height, which is at the beginning of the dorsal, is nearly the same with its transverse diameter there, but the compression is more decided towards the tail, whose thickness at the insertion of the caudal is little more than half its depth. The belly and under surface of the head are flattish, the back is more acute, particularly the posterior part of it. The *anus*, situated precisely as in *gobio*, is rather nearer to the snout than to the insertion of the caudal. There are no *scales*, the body and head being covered with soft skin. The *lateral line* consists of a series of little depressions with raised margins, and runs parallel to the ridge of the back, and nearer to it than to the belly.

TEETH.—The intermaxillaries, lower jaw, and vomer, are armed with short teeth, *en velours*. The tongue is smooth, very broad, short, and fixed.

FINS.—*Br.* 6; *P.* 15; *V.* 1/4; *D.* 8/—18; *A.* 14; *C.* 15.

The *pectoral fins* are large and fan-shaped, their longest rays, as in *gobio*, equalling the head in length. They are all articulated and unbranched. The *ventrals*, arising a little behind the pectorals, contain five rays; the first of which, a slender spine half the length of the others, is so closely applied to the succeeding articulated one as scarcely to appear distinct until the integuments are removed. Cuvier describes *gobio* as having one spinous ray in each ventral, and only three articulated ones; but in Mr. Yarrell's English specimen these fins correspond exactly, in the number of their rays, with *cognatus*.

The *first dorsal* commences a little farther back than the ventrals, and exactly at the same distance from the snout as in *gobio*, but it extends about a line farther along the back, and contains two more rays than in that species. All the rays are very slender and flexible, but not articulated, and are connected to their tips by a delicate membrane. The longest measures one-third of the height of the body. The *second dorsal* arises within less than a line of the first, and has an attachment twice as long, reaching to within three lines of the insertion of the caudal. Its rays (eighteen) are articulated and simple, except the two central ones, which are very slightly forked. [The English specimen of *gobio* has only six rays in the first dorsal, but Cuvier says they vary from six to nine: and the second dorsal has sixteen rays all articulated and simple, though Cuvier describes the last ray as forked, and some of the others as branched. There is a space, measuring two and a half lines, between the first and second dorsals, and their rays are one-third shorter than the corresponding ones of *cognatus*.]

The *anal* fin, similar in form to the second dorsal, has fourteen rays all articulated and simple. It commences opposite to the sixth ray of the second dorsal, and does not reach quite so near to the caudal fin. The *caudal* unites with the tail in a straight line, and contains fifteen rays, all more or less forked. It forms one-sixth of the total length as in *gobio*.

COLOUR.—The under surface is silvery-grey minutely spotted with dark brown : on the sides the dots are intermingled with crowded irregular blotches of the same colour, and on the back and top of the head the colour is dark brown, nearly uniform, few spots of the light colour appearing.

DIMENSIONS.	<i>C. cognatus.</i>		<i>C. gobio.</i>	
	Inches.	Lines.	Inches.	Lines.
Total length including caudal fin . . . . .	4	0	4	0
Distance between tip of muzzle and posterior edge of operculum	1	2	1	2
"          "          orbit . . . . .	0	3½	0	3½
"          "          first dorsal . . . . .	1	2½	1	2½
"          "          anus . . . . .	1	11	1	11
Length of attachment of first dorsal . . . . .	0	7½	0	5½
"          "          second dorsal . . . . .	1	3	1	3½
"          longest rays of pectorals . . . . .	0	10½	0	10½
"          "          ventrals . . . . .	0	7	0	7
"          "          caudal . . . . .	0	8½	0	8½
"          "          first dorsal . . . . .	0	4½	0	3½
"          "          second dorsal . . . . .	0	6½	0	4½
"          "          anal . . . . .	0	5½	0	4½

Some individuals of *C. cognatus*, which are full of roe, measure only two and a half inches of total length. All our specimens agree with each other in the number of rays in their fins. There are four pretty long *cæca* round the pylorus, and the viscera correspond with the description of those of *C. gobio* in the *Histoire des Poissons*. The stomach contained fragments of *dytisci*, and of other fresh-water insects and *crustaceæ*, and also of some small fish.

[12.] 2. *COTTUS POLARIS.* (Sabine.) *North Georgian Bull-head.*

*Cottus polaris.* SABINE, *App. Parry's First Voyage*, ccxiii. J. C. ROSS, *App.* liii.

This species is compared by Captain Sabine to *C. gobio*, but that has the head almost unarmed. It agrees with *C. claviger* in the number of rays in the dorsals, but its ventrals are described as having more rays than usual in this genus. Captain J. C. Ross informs us that it seldom exceeds two inches in length, and that it is very abundant on the east side of the peninsula of Boothia, affording a plentiful supply of food to the numerous water-fowl which breed there.

“*Cottus capite spinis duabus, operculis spinis quatuor armatis.*”

“A species of *Cottus*, similar in habits to *C. gobio*, was very abundant on the shores of North Georgia (lat. 75°), inhabiting the pools of water left by the tide, and the mouths of small rivulets by which the snow on melting found its way to the sea; the largest individual did not equal two inches in length; the head is more compressed and not so much flattened as in the *Cottus quadricornis*, and is armed with two strong spines placed before and between

the eyes: the gill-covers are also armed with four strong spines; the pectoral fins are larger in proportion than those of *C. gobio*, and the upper jaw rather exceeds the lower; the lateral lines are furnished with a series of small tubercles directed backwards: colour light, with clusters of minute dusky spots.

"FINS.—*D.* 6—13; *P.* 15; *V.* 5; *A.* 14. *C.* 14." (SABINE, *l. c.*)

8—13; 15; 5; 15. 12 to 14. (Capt. J. C. Ross.)

[13.] 3. *COTTUS HEXACORNIS.* (Richardson.) *Six-horned Bull-head.*

*Cottus hexacornis* (*Six-horned Bull-head*), RICHARDSON, *Frankl. Journ.*, p. 726. An. 1823.

Numerous specimens of this fish were caught in a net set in the mouth of a small river near the Coppermine, and the following description is drawn up from notes written on the spot:—The subsequent calamities which befel that expedition having occasioned the loss of all the specimens, no actual comparison has been made with other species; but after an inspection of the *Cotti* brought home by Captain Beechey, and an attentive perusal of the *Histoire des Poissons*, I am satisfied that it differs from all other described species in the form of the horns, or processes which arm the head, and in other particulars. From the peculiar shape of these horns in our species, it might bear the name of *claviger*, still more appropriately than the one so termed by M. Valenciennes.

The individuals that we caught retained life long after they were drawn from the water, leaping vigorously over the sands, and when touched inflating the head. In this operation the branchiostegous membrane is distended, and the several pieces composing the gill-covers are separated by the extension of the intervening membranes. Our Canadian voyageurs were both astonished and alarmed by these fish, and termed them *Crapauds de mer*, probably from a kind of croak they uttered when first handled.

DESCRIPTION

Of eight or nine recent specimens taken at the mouth of Tree River, near the Coppermine, lat. 67° 12' North.  
July 23rd, 1821.

SIZE.—About seven inches in total length.

COLOUR.—Of the upper aspect a clouded admixture of brocoli-brown and olive-green tints: of the belly white. The fins are streaked with bluish-black. *Irides* tinged with red.

FORM.—*Head* large and depressed. *Eyes* large. Six club-shaped, or rather nail-shaped processes stand erect on the top of the head: their summits flattish, minutely cancellated, and scabrous. The smallest pair stand between the nares: the largest over the posterior angles of the orbits; and the third of intermediate size on the occiput. The *mouth* is capacious.

Its margins are formed by the intermaxillaries and lower jaw. The maxillaries have an elongated wedge-form, and lie in a membrane behind the intermaxillaries. Both jaws and the vomer are set with bands of fine *teeth, en velours*. *Tongue* obtuse and smooth, as are the palate and maxillaries. The *preoperculum* is armed beneath with three strong divaricated spines, the posterior one, which measures half an inch, being the longest. The *gill-covers* are composed of several bones connected by membrane, and armed on their exterior edges with four or five small spinous teeth. The bones which support the pectoral fins are also armed with small spines and have sharp rough edges. The *branchiostegous membrane* contains six slender cylindrical curved rays. The *Body* is much narrower than the head, and tapers to the insertion of the caudal fin. The *anus* is situated midway between the mouth and the caudal. The *lateral line* is rough and runs near the back—above it there is a row of small orbicular, scabrous, bony plates, the row being doubled opposite to the second dorsal. There are no other perceptible *scales*.

FINS.—*Br.* 6. *P.* 16. *V.* 3. *D.* 7—13. *A.* . *C.* 12.

The *pectoral fins* are sub-orbicular and contain sixteen rays, none of them branched. The upper ray is scabrous throughout. The others are scabrous only near their middles. The *ventrals*, soft and whitish, have three rays, of which the first is the strongest, but none of them are spinous\*. The *first dorsal* commences posterior to the pectorals and terminates opposite to the anus. It has seven simple rays. The *second dorsal* is larger and has thirteen rays. Its commencement and termination correspond with those of the anal, and most of its rays are scabrous. Both dorsals are rounded or arched. The *anal fin* occupies about two-thirds of the space between the anus and caudal, commencing near the former. This fin becomes slightly lower or less deep posteriorly. The *caudal* is cuneiform and has twelve rays, most of them forked.

Obs. In the form of the bony processes, on the top of the head, this species approaches closely to *C. quadricornis* of the Baltic; but it does not appear, from the descriptions I have consulted, that there is a distinct pair on the nasal bones of the latter. There are also differences in the form of the spines of the *preoperculum*, those of *C. hexacornis* being quite simple, while in the other they are truncated, or divided at the point. In the *C. quadricornis*, also, there is a thick spine on the supra-scapular bone, which is likewise truncated; while in *C. hexacornis*, that bone, the humerals, and the gill-covers, are merely armed with *small* spinous teeth. And the rows of scales on the body are different.

It appears to me likely, that the *C. quadricornis*, Sabine (*Zool., App. to Captain Parry's First Voyage*, p. ccxiii), may be really the *C. hexacornis*. Captain J. C. Ross, who considers it to be the same with the *C. scorpioides* of Fabricius, says that, though very abundant on the Greenland coast, it is more rare in the higher latitudes, but several were taken on both sides of the peninsula of Boothia. The natives prize it highly as an article of food, preferring it to cod-fish or salmon. The Esquimaux of Boothia call it *Kaneok*, the same name which the Greenlanders give to *C. Grœnlandicus*.

\* It is possible that a small spine might be attached so closely to the first ray of the ventral as to escape my observation, or, as Cuvier says of the ventrals of *C. scorpius*, "*Elles sont étroites, et leur épine est si intimement unie à leur premier rayon, qu'elles paroissent n'avoir que trois rayons.*"



[14.] 4. *COTTUS OCTODECIMSPINOSUS*. (Mitchill.) *The Sculpin*.

*Scorpius Virginianus*, Willoughby, t. 2., 15.

Le Grand Chaboisseau à dix-huit épines de l'Amérique du Nord. CUV. et VAL., iv., 181.

This species has been confounded by several naturalists with the European *C. scorpius*, but it is quite distinct and of a considerably larger size. Its preopercular spine is longer than in that species, its point equalling or surpassing the spinous extremity of the gill-cover. The spines of its dorsal are, also, strong and pungent, instead of being flexible; and it differs much in its viscera from the European species. The stomach is a large thin bag, and the six cæca are so short as to look like a fringe: in *C. scorpius* the coats of the stomach are thick, and the pylorus is surrounded by eight cæca. The Sculpin\* abounds on the coasts of the United States, and is also plentiful at Newfoundland. It is a pity that Cuvier did not retain the original specific name given by Willoughby, who figured it correctly; it is preferable to *octodecimspinosus*, which may lead to error, there being, in fact, twenty spines on the head. *C. scorpius* has exactly the same number, ten on each side, viz., one at the nostril, one over the orbit, one on the nape, three on the preoperculum, one on the operculum, one on the suboperculum, and two on the scapular bones.

FINS.—Br. 6; D. 8 or 9 — 1/15; A. 14; C. 12; P. 18; V. 1/3. (*Hist. des Poiss.*)

[15.] 5. *COTTUS GRÆNLANDICUS*. (Cuvier.) *Greenland Bull-head*.

*Cottus scorpius*. FABRICIUS. *Fauna Grænlandica*, p. 156.

Le Chaboisseau du Grænland (*Cottus Grænlandicus*). CUV. et VAL., iv., p. 185.

Kaniok. GRÆNLANDERS.

It has been usual to enumerate the quadrupeds and birds of Greenland as belonging rather to Europe than America; but the fish existing in Davis's Straits, even on the Greenland side, associate more naturally with the American ones. The *C. Grænlandicus* is known only by Fabricius's description, which agrees well with the Sculpin of the United States above mentioned, except that he counts only sixteen spines on the head and shoulder, and mentions obtuse, rough tubercles

\* Quasi Scorpion.

on the cranium, but no spines. It is abundant in all the bays and inlets of Greenland, but prefers a stony coast clothed with sea-weed. It approaches the shore in spring and departs in winter. It is very voracious, preying on every thing that comes in its way, and pursuing incessantly the smaller fish, not sparing the young of its own species, and devouring crustacea and worms. It is very active and bold, but does not come to the surface unless it be led thither in pursuit of other fish. It spawns in December and January, and deposits its red-coloured roe on the sea-weed. It is easily taken with a bait, and constitutes the daily food of the Greenlanders, who are very fond of it. They eat the roe raw.

FINS.—Br. 6; D. 10/ — 17; A. 14; C. 17; P. 17; V. 3. (*Fauna Grænl.*)

[16.] 6. *COTTUS SCORPIOIDES*. (Fabricius.) *The Pokudleek*.

Le petit Chaboisseau du Grænland (*Cottus scorpioides*). CUV. et VAL., iv., p. 187.

This species, according to the description given of it by Fabricius, approaches some of the European species, and a comparison of specimens is required to establish it as distinct. It is named "Pokudleek" by the Greenlanders, and frequents muddy places near the mouths of rivers, preferring brackish water.

The rays of its Fins are D. 10 — 15; A. 12; C. 15; P. 15; V. 3. (*Fauna Grænl.*)

[17.] 7. *COTTUS POROSUS*. (Valenciennes.) *Porous Bull-head*.

Le Chaboisseau poreux (*Cottus porosus*). CUV. et VAL., viii., p. 498.

This species resembles the *C. scorpius* of Europe in the armature of the top of its head and gill-covers, and *C. Grænlandicus*, or *scorpioides*, in the great number of its dorsal rays. A specimen, six inches long, was taken in Baffin's Bay, which had several hundreds of very small shrimps in its stomach.

FINS.—Br. 6; D. 11 — 1/16; A. 13; C. 17; P. 18; V. 1/3. (*Hist. des Poiss.*)

[18.] 8. COTTUS POLYACANTHOCEPHALUS. (Pallas.) *Many-horned Bull-head.*

"Cottus polyacanthocephalus. PALL., *Zoogr. Ross.*, p. 133, No. 104, pl. 23."  
La cotte à tête très épineuse. CUV. et VAL., iv., p. 177.

This species was taken on the north-west coast of America, in the 60th degree of latitude, off Cape St. Elias, by Billings. It approaches to *quadricornis* in its characters, but its opercula are better armed.

FINS.—D. 10 — 1/14; A. 12; P. 17; V. 4; C. 15; and some small ones.

(*Hist. des Poiss.*)

[19.] 9. COTTUS PISTILLIGER. (Pallas.) *Antlered Bull-head.*

"Cottus pistilliger. PALL., *Zoogr. Ross.*, t. iii., p. 143, pl. 20, f. 3 and 4."  
Le Chaboisseau à bois de chevreuil. CUV. et VAL., iv., p. 193.

This very curious Bull-head, which resembles *C. diceraus* in some of its characters, is found at Unalashka, and also on the Kamtschatka coast.

FINS.—D. 9/ — 13; A. 16; C. 13; P. 18; V. 1/3. (*Hist. des Poiss.*)

*Cottus diceraus* of Pallas, and *C. claviger* and *ventralis* found by Mr. Collie at Kamtschatka, and described by Mr. Bennett in the Natural History Appendix to Captain Beechey's Narrative, and also in the *Histoire des Poissons*, together with *C. Mertensii* and *C. marmoratus* of the latter work, may possibly exist on the eastern as well as on the western entrance to Behring's Straits; but as they have not been actually detected on the American coast, they are not entitled to a place in the Fauna of that country.

[20.] 1. COTTUS (ASPIDOPHORUS EUROPEUS.) (Cuvier.) *The Pogge.*

GENUS, Cottus. Sub-genus, Aspidophorus. CUV., LACÉP.  
L'Aspidophore d'Europe (*Aspid. Europæus*). CUV. et VAL., iv., p. 201.

The *Aspidophori* are considered, in the *Regne Animal*, as forming merely a sub-genus of *Cottus*, from which they are distinguished by the want of vomerine

teeth, and by the body being cased in large keeled, angular scales, and acquiring thence the form of a slender, many-sided pyramid. The latter character gives the *Aspidophori* a totally different aspect from the *Cotti*. The only species that has been discovered in the European seas, is well known to naturalists as the *Cottus cataphractus* of Linnæus. It is very abundant on both sides of the English Channel, particularly on the Lincolnshire coast, and ranges northward to the Cattegat and Baltic, and westward to Iceland and Greenland. Its occurrence on the Davis' Straits' side of the latter country entitles it, according to the plan of our Fauna, to be mentioned here.

This species varies in length from three to six inches. The anus is far forwards, and the body, between it and the hinder part of the anal and second dorsal, is octagonal; the slender tail and the forepart of the body are hexagonal; the mouth opens transversely under the muzzle, and there are small barbels, or fleshy points, covering the whole surface of the branchiostegous membrane, the corners of the mouth, and border of the interoperculum; there are two at the extremity of the snout, and a minute one before each orbit.

FINS.—Br. 6; D. 5—7; A. 7; C. 11; P. 15; V. 1/2. (Some specimens have only six rays in the second dorsal and anal.) *Hist. des Poiss.*

[21.] 2. COTTUS (ASPIDOPHORUS) ACIPENSERINUS. (Cuvier.) *Sturionic  
Aspidophore.*

L'Aspidophore esturgeon. Cuv. et VAL., iv., p. 207.

This species is common at the Island of Oonalaschka, and on the coast of Kamtschatka. It passes under the name of *lisitza*, or the "fox," among the Russians, and of *koschadanguisch* among the Aleutians. It is distinguished from the preceding by many characters, the most striking of which are the want of barbels on the branchiostegous membrane, and the numerous polygonal plates, marked with stelliform streaks, which cover the breast before the ventrals; while in the European species that part is covered by four plates only, arranged in a square form.

FINS.—Br. 6; D. 9/—8; A. 8; C. 11; P. 17; V. 1/2. (*Hist. des Poiss.*)

[22.] 3. COTTUS (ASPIDOPHORUS) MONOPTERYGIUS. (Cuvier.) *Aspidophore*  
with one Dorsal.

L'Aspidophore à une seule dorsale. CUV. et VAL., iv., p. 224; vi., p. 554, t. 169.

The two preceding *Aspidophori* have the second dorsal commencing close to the end of the membrane of the first, and the mouth situated rather behind the tip of the snout; three other species, with approximated dorsals, are described in the *Histoire des Poissons*, but they have the under jaw longer than the upper one, and the snout neither projects beyond the mouth nor supports spines. Three species also are described with their dorsals some distance apart, and these have the jaws of equal length, and thick spines in the first dorsal.

The species we have now to notice is distinguished from all others by having only one dorsal placed in the middle of the body, over the anal, both these fins consisting of few rays, all flexible, the first ray alone not appearing articulated. It is the most slender of the genus, the height of the body, at the ventrals, not exceeding one-fifteenth of the total length. Before the dorsal the body is four-sided, or if the facets produced by the keels of the scales be taken into account, eight sides may be reckoned: the tail is six-sided. The snout projects beyond the mouth.

FINS.—Br. 6; D. 1/4; A. 1/4; V. 1/2, C. ; P. 11.

This *Aspidophore* was supposed, by Bloch, its first describer, to come from India, and it was named by Lacépède *Aspidophoroide Tranquebar*; but it has lately been discovered to be an inhabitant of the Greenland Seas, so that this sub-genus belongs entirely to the Northern hemisphere, and chiefly to the higher latitudes.

(*Hist. des Poiss.*)

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[23.] 1. HEMITRIPTERUS AMERICANUS. (Cuvier.) *The Sea-raven.*

FAMILY, Cottoides. GENUS, Hemitripterus, CUVIER.

Acadian Bull-head. PENN., *Arct. Zool.*, ii., p. 118. No. 101.

Yellow Scorpenæ (*Scorpena flava*). MITCHILL, *Ph. Trans. New York*, i. p. 382, t. 2. f. 8.

L'Hemitriptère de l'Amérique (*Hemitripterus Americanus*). CUV. et VAL., iv. p. 268.

The genus *Hemitripterus* is considered by Cuvier as exactly intermediate between the *Cotti* and *Scorpenæ*, the two distinct dorsals with the broad head giving it a resemblance to the former, while its many and various *tentacula*, or barbels, and its palatine teeth, bring it near the latter. The head is bristled,

spinous, and garnished with many shreds of skin; and the first dorsal is so deeply notched, that three dorsals have been reckoned by some. Only one species is known. It attains the length of two feet, and inhabits the cod-banks on the coast of New York, Nova Scotia, and the Gulf of St. Lawrence, where it is often taken by the hooks set for cod-fish. Its skin is soft and finely granular, with little conical tubercles scattered over the back and sides. The flanks have a bright carmine tint, at least in certain localities, as at the Magdalene Islands.

FINS.—*Br.* 6; *D.* 15—12; *A.* 14; *C.* 12; *P.* 18; *V.* 1/3. (*Hist. des Poiss.*)

[24.] 1. HEMILEPIDOTUS TRACHURUS. *The Hiekejak.*

FAMILY, Cottoideæ. GENUS, Hemilepidotus, CUVIER.  
 "Cottus trachurus. PALL., *Zoogr. Ross.*, t. 3, p. 138, pl. 25."

This is another genus intermediate between *Cottus* and *Scorpæna*; but which has, on the whole, more affinity to the latter. In the form of the head, and in the distribution of its spines, there is a resemblance to the *Cotti*; but in the solitary dorsal, and the teeth on the palate bones, as well as on the vomer, it partakes of the characters of the *Scorpæna*: it is distinguished at once from both genera by two broad longitudinal scaly stripes on each side alternating with stripes of smooth skin: the scales become visible as the skin dries. Captain Billings obtained one specimen among the Kourile Islands, and another on the American coast, where the species was observed also by Steller, who says that the inhabitants of the Aleutian Islands name it *hiekejak*. Pallas described Billings' specimen, and Cuvier states the description to agree exactly with his *H. Tilesii*, except that it gives two rays more to the soft dorsal, and that a division is mentioned between the first three spines of that fin and the eight succeeding ones. The rays of *C. Tilesii* are *Br.* 6; *D.* 11/18; *A.* 1/14; *C.* 12; *P.* 17; *V.* 1/3. Steller gives the following anatomical details of those he examined. The liver had three lobes and many biliary ducts, but no gall-bladder was detected. The stomach of an individual, a foot long, was no bigger than an acorn, and it contained a small flounder, some crabs, and a madreporæ. There were five pretty long *cæca* at the pylorus. (*Hist. des Poiss.*)

[25.] 1. SCORPÆNA (SEBASTES) NORVEGICA. (Cuvier.) *Northern Sebastes*.

FAMILY, Cottoideæ. GENUS, *Scorpæna*, LINN. *Sub-genus*, *Sebastes*, CUV.  
 Sea Perch. PENN., *Br. Zool.*, iii., p. 349, pl. 59, f. 2.  
 La Sebaste septentrionale (*Sebastes Norvegicus*). CUV. et VAL., iv., p. 327.

The *Scorpæna* have a strong resemblance to the *Cotti* in possessing a large spiny head, large pectorals, and, in part, the thick simple rays of these fins, but they differ in the compressed form of the head, the undivided dorsal, and in the presence of palatine teeth. They have seven branchiostegous rays. The clumsy head and soft spongy skin of the *Scorpæna* give them a hideous aspect, and the spines with which they are armed are formidable to those who attempt to handle them. Setting aside the bony armour of the cheeks, the spines of the head, and the simple inferior rays of the pectorals, they have much affinity with some of the percoideæ, particularly *Grystes* and *Centropristis*. None of the true *Scorpæna* are mentioned by authors as existing within the limits which we have assigned to our Fauna, but the *Scorpæna porcus*, which has an extensive range in Europe, throughout the Mediterranean, and from the British Channel to Teneriffe, occurs also at New York.

We have, however, to notice two northern species of *Sebastes*, a sub-genus, which possesses all the characters of *Scorpæna*, except that the head is scaly, is less studded with spines and crests, and wants the skinny shreds or appendages. The resemblance of the *Sebastes* to some of the Percoideæ with a solitary dorsal is such, that they have been considered as congeners by naturalists of the first rank. The *Sebastes Norvegica* inhabits the Icy Sea and Northern Ocean. It is plentiful on the Norway coast, and is found at Iceland, Greenland, in the Gulf of St. Lawrence, and off Newfoundland. It inhabits the deepest bays of South Greenland, and does not approach the shore, except when driven thither by tempests. It feeds upon the *pleuronectes cynoglossum*, and readily takes a hook. Its flesh is dry but agreeable. The Greenlanders eat its lips raw, and were formerly accustomed to use its spines as sewing needles. It has a swimming bladder, which the *Scorpæna* have not, and which does not exist in all the *Sebastes*.

Its colour, when quite fresh, is a bright carmine, which is paler towards the belly, and mixed with brown on the back; there is likewise a blackish mark on the tip of the gill-cover. In form this *Sebastes* resembles the perch, that is, its body is somewhat compressed, and its profile oblong, the dorsal and ventral curves being slightly convex; the mouth is oblique and the lower jaw projects a little. The posterior sub-orbital bone sends a process obliquely back-

wards towards the preoperculum, which it does not quite reach, so that we can scarcely say that the cheek is mailed. The whole fish is clothed with small rough scales, even to the extremity of the snout and on the labials, the only naked parts being the branchiostegous membrane and the posterior borders of the gill-opening, including the base of the pectorals. Belts of minute scales cover the basal halves of the vertical fins.

FINS.—*Br.* 7; *D.* 15/ — 15; *A.* 3/8; *C.* 14; *P.* 19; *V.* 1/5. (*Hist. des Poiss.*)

The Mediterranean possesses a species of *Sebastes* which differs from the above in a few characters, and at the Cape of Good Hope there is one which very closely resembles the northern species, and another which is more like the Mediterranean one. There are two or more in the Indian and Polynesian seas, and several in the sea of Japan. The following one is from the sea of Kamtschatka.

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[26.] 2. *SCORPÆNA (SEBASTES) VARIABILIS.* (Cuvier.) *The Tockoo.*

La Sebaste variable (*Sebastes variabilis*). CUV. et VAL., iv., p. 347.

This *Sebastes* has the head less armed than any other species; there are not even crests on the cranium, or over the orbits, and no teeth on the sub-orbitars: the preoperculum has five short, obtuse teeth, and the operculum two points. That it belongs, however, to this genus is evident from the narrow process which the posterior sub-orbital sends towards the preoperculum, and which may be felt through the skin, and also from the nine simple rays of the pectorals. FINS.—*D.* 13/15; *A.* 3/9; *C.* 17; *V.* 1/5; *P.* 18, of which nine are simple. It is taken plentifully among the Aleutian Islands, and is named *kakootsheek* by the inhabitants, and *tockoo* on the American coast. Vancouver found a "sea-perch" at Port Discovery, in the Straits of Juan da Fuca, which may be this species; but the name is too vaguely applied by sailors to render even the genus anything more than conjectural.

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[27.] 1. *BLEPSIAS TRILOBUS.* (Cuvier.) *Three-lobed Blepsias.*

FAMILY, Cottoideæ. GENUS, *Blepsias*. CUVIER.  
Le Blepsias trilobé (*Blepsias trilobus*). CUV. et VAL., iv., p. 375, pl. 90.

The spiny preoperculum, compressed head, mailed cheek, palatine teeth, short, simple, and half-detached lower rays of the pectorals, and fleshy appendages



of the snout, connect this genus with *Scorpæna*, from which, however, it is distinguished by its five branchiostegous rays, and its high dorsal divided into three unequal lobes, as in *Hemitripterus*; whilst the compressed head prevents it from entering the latter genus. The detailed description of the species in the *Histoire des Poissons* is founded on the examination of two individuals which were taken on the north-west coast of America by Merk. Steller observed the same species at the entrance of the sea of Ochotsk. The general aspect of the fish recalls that of some Blennies with which it was associated by Steller. The skin is destitute of scales, but is rough, with fine grains, which appear to be disposed in three longitudinal stripes, separated by very narrow intervals. The specimens were five inches long.

FINS.—*Br.* 5; *D.* 7/24; *A.* 20; *C.* 11; *P.* 11; *V.* 1/3. (*Hist. des Poiss.*)

Another species (*B. bilobus*, Cuv. et Val.) occurs in Awatska Bay, Kamtschatka. It has been described and figured as the type of a new genus by Mr. Bennett, in the Natural History (Appendix) to Captain Beechey's Voyage, under the name of *Peropus bilobus*, on account of the form of its dorsal, indicated by its specific name, and its six branchiostegous rays; in other particulars *Peropus* coincides almost exactly with *Blepsias*. In *P. bilobus* there is a short spine over the nostril, and there are six fleshy appendages to the lower jaw, and two to the upper. The skin is hispid with short rigid bristles without any smooth stripes. Its FINS contain *Br.* 6; *D.* 7—21; *A.* 19; *C.* 13; *P.* 14; *V.* 1/3. The following anatomical particulars are from Mr. Collie's notes. *Air bladder* wanting. *Stomach* a large membraneous sac. *Cæca* several, ventricose. *Intestinal canal* short. *Liver* light clay colour. (App. Beech. Voy., p. 59, pl. 16, f. 3.)

[28.]

1. GASTEROSTEUS. *Burnstickle.*

*Gasterosteus aculeatus.* FABRICIUS, *Faun. Grænl.*, p. 169.  
Kakilisak. GREENLANDERS.

This genus wants the family aspect of the Cottoidæ, for the sub-orbitals being smooth, and not distinguishable through the integuments, the cheek-mail is not apparent, neither is the head armed with tubercles or spines. The dorsal spines are detached, each having a separate membrane, and the pelvic bones are united to the more than ordinarily large humerals, so as to form a kind of breast-plate. The ventrals, situated posterior to the pectorals, are almost entirely formed of their

single spinous ray, and the gill-rays do not exceed three. The Burnstickles, or Sticklebacks, are the smallest of European fresh-water fishes, and probably also the most abundant, as they exist in almost every rivulet and piece of water. They are active, lively little fish, and when any obstacle obstructs their way, will leap a foot out of the water, in endeavouring to surmount it. They are exceedingly voracious, and commit great havoc in fish-ponds, where they devour vast numbers of young fish at the instant of their exclusion from the roe. The *G. aculeatus* (L.), or the Three-spined Stickleback, the largest species, abounds in every corner of Europe\*, and even extends to Greenland, if the *Kakilisak* of Fabricius, above referred to, be actually this species, and not one of the very similar American ones. This author states, that it inhabits every pool and rivulet of Greenland, and even those into which the tide enters, feeding on worms and aquatic insects. In Europe two species were long confounded under the appellation of *aculeatus*, until Cuvier distinguished them by the names of *G. trachurus* and *leiurus*.

In both species the forepart of the back is covered by five bony plates, on the second, third, and fifth of which stand the three dorsal spines. The third spine is sometimes wanting, and at other times the fourth plate gives origin to an extra spine. The flanks are protected by a series of oblong plates having their axes vertical: in *G. trachurus* these plates are continued along the sides of the tail, there being in all twenty-five or twenty-six, exclusive of five small ones that cover the keel of the tail and render it more prominent; in *G. leiurus* the six anterior plates only are present, the posterior parts of the fish being smooth.

FINS.—*Br.* 3; *D.* 1/—1/—1/—10 or 11; *A.* 1/—9; *C.* 12½; *P.* 10; *V.* 1/1.

Fabricius says that the *Kakilisak* seldom exceeds the little finger in length, that its forehead is marked with black in form of a spade, and its anal fin contains ten soft rays besides the spine: in other respects he refers to Artedi's description (*Sp.*, p. 96), which is that of *G. trachurus*.

Five other European three-spined Burnstickles are described in the *Histoire des Poissons*, and there is one in the sea of Kamtschatka, which, at the summer solstice, ascends the rivers of Awatska, Paradunca, &c., in such dense shoals that it may be taken up with a pitcher in equal quantity with the water itself. It is named *G. obolarius* †, but the detailed descriptions of Steller, Pallas, and Tilesius do not indicate any characters so decided that Cuvier could pronounce it to be a distinct species. It derives its name from the smooth silvery spot which intervenes

\* In certain places it appears occasionally in enormous shoals, so that it is taken for the purpose of manuring the land. A labourer, hired by a Lincolnshire farmer to collect it in the river Welland, at the rate of one halfpenny a bushel, earned four shillings a day. (*Brit. Zool.*)

† "*Obolarius aculeatus*, STELLER, *Mss.*" "*Gasteracanthus cataphractus*, PALL., *Faun. Ross.*" "*Gasterosteus cataphractus*, TILZANUS, *Mém. de Petersb.*, iii., p. 225.

between the pectorals and gill-openings, having the form of a piece of Greek money. It has thirty-one vertebræ and the same number of lateral scales. The four dorsal spines are serrated. The Kamtschatdales collect it to serve as food for their dogs, and they also prepare excellent white soup with it for themselves.

*G. Novaboracensis* is, as the name indicates, a New York species.

It has a very strong resemblance to the *G. trachurus*, its most obvious peculiarities being the narrow dorsal plates, the more prominent keels of the tail, and the position of the lateral line, which is nearer to the back.

FINS.—*D.* 1/1/—1/11; *A.* 1/8; *C.* 12; *P.* 10; *V.* 1/1. (*Hist. des Poiss.*)

[29.] 2. *GASTEROSTEUS NIGER.* (Cuvier.) *Black Burnstickle.*

L'Épinoche noire (*Gasterosteus niger*). CUV. et VAL., iv., p. 503.

This species, which has also an armed tail, inhabits Newfoundland. It has a more elongated form, and more slender spines than its European representative. Its lateral scales amount to thirty-three, and its colour throughout is blackish.

(*Hist. des Poiss.*)

[30.] 3. *GASTEROSTEUS BIACULEATUS.* (Pennant.) *Two-spined Burnstickle.*

*Gasterosteus biaculeatus.* FORSTER, *Cat.* MITCHILL, *Phil. Tr.*, New York, i, p. 430, pl. 1, f. 10.

Two-spined Stickleback. PENN., *Arct. Zool.*, ii., p. 132, No. 147.

L'Épinoche à deux épines. CUV. et VAL., iv., p. 503.

This Stickleback is said, by Dr. Mitchill, to inhabit the salt waters of New York, and to consort with the Killifish, or Cyprinodons. M. Pilaye sent it from Newfoundland to Cuvier. It is one of the smallest of the genus, Dr. Mitchill assigning it a length of scarcely an inch, and the Newfoundland specimen measuring only seventeen lines.

It is distinguished from the other species by a sharp flat tooth on the external base of each ventral spine, the European species having simply an enlargement there. Notwithstanding its name, it has *three* dorsal spines, the third being small and joined to the soft dorsal.

FINS.—*D.* 1/1/ — 1/12; *A.* 1/8; *C.* 12; *P.* 9; *V.* 1/1. (*Hist. des Poiss.*)

Pennant mentions the Three-spined Stickleback as very plentiful at Hudson's Bay (*Arct. Zool.*, ii., p. 132, and *Intr.*, p. cxci), but it did not come under my notice, and as the species in that naturalist's time were but imperfectly discriminated, its reference to *G. aculeatus* must be doubtful. Hutchins speaks of Sticklebacks three inches in length, which constitute food for the pike and turbot.

[31.] 4. GASTEROSTEUS CONCINNUS. (Richardson.) *Tiny Burnstickle.*

Uswæ-atheek-ashesh. CREE INDIANS.

This diminutive species, perhaps the smallest of fresh-water fishes, is found at the commencement of summer in ponds and rivers, and is supposed to be washed out of the lakes by the floods of melted snow which occur at that period. It ranges from the Saskatchewan in lat. 53°, to the Great Bear Lake in the 65th parallel, and probably through a still greater extent of country. In 1820, many sledge-loads were taken from a small pond in the vicinity of Cumberland-house for the purpose of feeding the dogs. Although it has a strong general resemblance to *G. pungitius*, or rather *lævis* of Europe, it exhibits differences which justify us in considering it as a distinct species. It has a still smaller size than *G. lævis*, a more slender and elegant form, stronger and higher spines, and lower second dorsal and anal fins, the portion of the tail behind these fins being thinner as well as longer.

DESCRIPTION

Of specimens taken at Great Bear Lake, lat. 64½ N., and comparison with an English specimen of *G. lævis*, belonging to Mr. Yarrell.

FORM.—Similar to that of *G. lævis*, but the head smaller, being only a fourth part of the total length, and the body, and especially the tail, more slender. The *mouth* is also smaller, and the teeth, although perceptible to the touch on both jaws, are much less conspicuous than those of *lævis*. There are no scales whatever on the body. The *lateral line* is a straight furrow until it passes the anal fin, when it rises into a very slender ridge that keels the tail. The anus is equidistant from the snout and end of the tail: in *G. lævis* it is a little farther back. The abdomen is protected by a bony cuirass, formed posteriorly by the bones of the pelvis, and anteriorly by two narrow cubital bones which join in an acute angle behind the median insertion of the gill-membranes. In *concinus* the posterior angular point of the pelvic bones is narrower but stronger, and the space enclosed by the cubital bones is triangular: in *lævis* this space is triangular only towards the apex, the two bones being parallel posteriorly. The smooth space between the insertion of the pectoral and the gill-opening is smaller in *concinus*, its nine *dorsal spines* are both stouter and longer, and the triangular

membrane which is attached to each of them posteriorly, is thicker and larger than in *lævis*. In both species the seventh and eighth spines are smaller than the preceding ones, and the ninth, which is contiguous to the second dorsal, is rather longer than any of the others: in *concinus* it is only one-third lower than the second dorsal; while in *lævis* it is two-thirds lower. The second dorsal and anal begin and terminate opposite to each other, and have similar triangular shapes: the posterior angle of these fins in *lævis* is more prolonged or acute; while in *concinus* the fins have an equilateral outline, in consequence of their attachments being shorter, and the naked tail longer. In *concinus* the soft dorsal has nine rays—in *lævis* it has eleven. Contiguous to the anal fin of the former there is a separate spine, furnished with its proper membrane, like the dorsal spines, the largest of which it equals in size: in *lævis* this spine is comparatively small. The *ventrals* are each represented by a spine articulated to the pelvic bones, and a small triangular membrane in which there is imbedded a very indistinct soft ray: the ventral spines do not reach quite to the point of the abdominal cuirass in either species. All the spines, both dorsal and ventral, are moveable, and none of them are serrated. The *caudal fin* is even at the end and has an elongated wedge shape.

COLOUR nearly as in *G. lævis*, olive green, with a silvery belly, and the whole body and soft parts of the head speckled with black dots.

FINS.—*Br.* 3; *D.* 1/-1/-1/-1/-1/-1/-1/—1/9; *A.* 1/—9; *P.* 10; *C.* 12 $\frac{1}{2}$ ; *V.* 1/1.

	DIMENSIONS.		<i>G. concinns.</i>		<i>G. lævis.</i>	
	Inches.	Lines.	Inches.	Lines.	Inches.	Lines.
Length from tip of snout to end of caudal . . . . .	1	3 $\frac{1}{2}$	1	8 $\frac{1}{2}$	1	8 $\frac{1}{2}$
” ” anus . . . . .	0	8	0	11 $\frac{1}{2}$	0	11 $\frac{1}{2}$
” ” tip of gill-cover . . . . .	0	4 $\frac{1}{2}$	0	4 $\frac{1}{2}$	0	4 $\frac{1}{2}$
” of attachments of second dorsal and anal . . . . .	0	2 $\frac{1}{2}$	0	4 $\frac{1}{2}$	0	4 $\frac{1}{2}$
” naked tail between dorsal and caudal : . . . . .	0	2 $\frac{1}{2}$	0	2 $\frac{1}{2}$	0	2 $\frac{1}{2}$
” from anus to end of caudal . . . . .	0	8	0	9 $\frac{1}{2}$	0	9 $\frac{1}{2}$
” of longest rays of caudal . . . . .	0	2 $\frac{1}{2}$	0	2 $\frac{1}{2}$	0	2 $\frac{1}{2}$
” ” second dorsal . . . . .	0	1 $\frac{1}{2}$	0	2 $\frac{1}{2}$	0	2 $\frac{1}{2}$
” ” anal . . . . .	0	1 $\frac{1}{2}$	0	2 $\frac{1}{2}$	0	2 $\frac{1}{2}$
” anal spine . . . . .	0	1 $\frac{1}{2}$	0	1	0	1
” ventral spines . . . . .	0	1 $\frac{1}{2}$	0	1 $\frac{1}{2}$	0	1 $\frac{1}{2}$

[32.] 5. GASTEROSTEUS OCCIDENTALIS. (Cuvier.) *Newfoundland Burnstickle.*

L'Epinchette de Terre Neuve (*G. occidentalis*). Cuv. et VAL., iv., p. 509.

This species, which was discovered in Newfoundland by M. Pilaye, is very like the nine-spined Stickleback of Europe with an armed tail: its form is merely more lengthened. FINS.—*D.* 8/9; *A.* 1/9; *C.* 12; *P.* 11; *V.* 1/11. (*Hist. des Poiss.*)

[33.] 1. TEMNISTIA VENTRICOSA. *North-west Notchfin.*

FAMILY, Cottoidæ. GENUS NOVUM, *Temnistia* \* prope *Hemilepidotum*.

*Blepsias ventricosus*. ESCHSCHOLTZ, *Zool. Atlas, drittes heft*, p. 4, t. 13.

*B. corpore fusco; facies quatuor flexuosis maculæque posticæ rubris; abdomine inflato albo fuscoque marmorato; pinnis pectoralibus facies tribus hepaticis pallidisque alternantibus.* ESCH. l. c.

This fish frequents the north-west coast of America, having been taken in Norfolk Sound, and off the island of Sitcha, by the Russian Expedition under Captain Kotzebue. Eschscholtz states it to possess all the characters of *Blepsias*, but though it does in part correspond with the short notice of that genus in the *Règne Animal* \*, it differs both in habit and in structure from the only two species of *Blepsias* hitherto discovered. It belongs to that group of Cottoidæ which is characterised by the compressed form of the head, and has much resemblance in external form to *Hemilepidotus* and *Scorpena*, between which it will probably stand in a natural arrangement. It is separated from the former by its body being wholly scaly, and the presence of barbels on the head; and from the latter, by having only five gill-rays and a three-lobed dorsal. The want of scales on the head distinguishes it from *Sebastes*, and its habit, which is very unlike that of a blenny, its long pectorals and scaly body, detach it from *Blepsias*. The other Cottoid genera, with compressed heads, are still more dissimilar in external characters to this fish: *Pterois* has seven gill-rays, and is remarkable for the extreme length of the rays of its dorsal and pectorals; *Apistes* and *Minous* are armed with a large, moveable, sub-orbital spine; *Agriopus* has a scaleless body and unarmed, imperfectly cuirassed cheeks; and *Hoplostethus* has its deep body protected inferiorly by keeled scales, and six soft rays in its ventrals. We have, therefore, ventured on giving Eschscholtz's fish a proper generic name; but as the *Zoologischer Atlas* contains no account of its dentition, nor any anatomical details, we shall not attempt any further enumeration of the characters of the genus, than what may be gathered from the following description of the species, which is compiled partly from the text of the work just cited, and partly from an inspection of the plate.

\* Th. τῆρας, scindo, et ἰρίαν, velum.

† Les *Blepsias* ont la tête comprimée, la joue cuirassée, des barbillons charnus sous la mâchoire inférieure, cinq rayons aux ouïes, de très petites ventrales, et une dorsale très haute, divisée en trois par des échancrures. Règ. An.

## DESCRIPTION.

FORM.—The *head* is much compressed, the *eyes* large, lateral, and closely approximated, as in *Hemilepidotus*. The *intermaxillaries* appear to be capable of some protrusion, and to be connected with the snout by a whitish membrane; immediately behind which, on the upper surface of the snout, there is a pair of brown, short, cylindrical processes, and before the eyes two pairs of white ones, all of them said to be tubular. There are three pairs of short, slender, acute barbels on the lower jaw; a thick one with a fringed end on the lower extremity of the labial, and one like it, though smaller, on the lower part of the cheek. The plate also represents six prominent, obtuse, though small teeth (or, perhaps, barbels) on the margin of the sub-orbital bone; three large acute teeth, or spines, and two intervening small ones, on the preoperculum; a notch on the margin of the suboperculum; and an acute angular tip to the gill-cover. The head is entirely naked; but the body is covered with large tiled scales, which are described as being roundish, finely toothed, and biggest on the sides, where there are fifty-eight in a longitudinal row. The form of the *body* is that of a *Hemilepidotus*, or *Scorpæna*, exclusive of the greatly-inflated stomach or belly, which is pendulous and hemispherical. The *dorsal fin* commences a very short way behind the nape, and extends nearly to the caudal: it is supported by thirty-one rays, all spinous, and is notched anterior to the twelfth ray, by the gradual decrease of the six preceding ones. There is another, but less decided notch at the third ray, the membrane of which reaches only to the middle of the following ray. The rays of the *anal*, *pectorals*, and *ventrals*, are also represented as spinous, or at least simple, the caudal ones alone being forked at the tips. The *ventrals* are long and slender, and are supported by five rays, the first of which is short and closely applied to the next. The *caudal* is slightly rounded at the end.

FINS.—*Br.* 5; *D.* 31/; *P.* 16/; *V.* 5/; *A.* 16/; *C.* 11‡.

COLOUR.—The *head* is mostly brown, the *body* is also brown, with scattered darker spots, and four transverse, broad, waved red bands, the first of them crossing just before the dorsal: there is also an imperfect band, or large patch, of the same colour, between the dorsal and upper base of the caudal. The *belly* is white, studded laterally with brown spots, which towards its middle diminish to specks. The *dorsal*, *anal*, and *caudal* are reddish, the two former being marbled with brown. The *pectorals* are marked transversely with three dark reddish-brown bars, and as many alternate pale ones.

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## SCIÆNOIDEÆ.

THE members of this family have almost all the external characteristics of the Percoideæ: the spiny or denticulated operculum: the toothed or armed preoperculum: the double, deeply-notched, or single dorsal: the scaly body; and even the divisions of the family which spring from the various combinations of these characters are but repetitions of those into which the Percoideæ are distributed. The distinctive character of the *Sciænoideæ* is the total absence of vomerine and palatine teeth. Moreover, the cavernous structure of the cranium, and arched form of the head, and especially of the nose, give a peculiar physiognomy to the fish of this family, which is rarely observed in the Percoideæ: the scales, also, are less rough, and extend more generally over the head and vertical fins: but these latter characters are not so essential as the perfectly toothless palate, and are, indeed, mostly present in the percoid genus *Polynemus*. The *Sciænoideæ* have much resemblance to the Percoideæ in their internal structure, also, though their air-bladders exhibit a greater variety of forms, being in many species complicated with hornlike processes, or branched or fringed appendages, which Cuvier thinks have some connexion with the grunting noises that the *Sciænoideæ* emit in a more remarkable degree than even the gurnards. The *Sciænoideæ* are numerous, have similar habits to the Percoideæ, and are equally useful to man, almost all of them furnishing a wholesome food, and many being remarkable for their exquisite flavour.

Cuvier divides the *Sciænoideæ* into two series, the *first* of which is characterised by a double or divided dorsal. The Maigre (*Sciæna*), Corvina, and Umbrina, three Mediterranean fish, are types of the principal genera of this series: several smaller genera are associated with them; and all have the cranium heightened by salient portions, the lower jaw pitted with conspicuous pores, the soft dorsal proportionably long, the anal, on the contrary, very short, the preoperculum denticulated, at least in the younger individuals\*, the bony operculum terminated by two flat points and seven branchiostegous rays; in short, they have a close resemblance to the perches, except that their palates are quite smooth. Moreover, their dorsal

\* This must be understood with some latitude, for *Nebria* and *Eleginus*, of this series, have the preoperculum smooth, or, as Cuvier says of that of the latter, "très entier." In the second series, *Glyphisodon*, *Etropus*, and *Heliases*, also want denticulations on the preoperculum.



spines are robust, the scales strong as in the perches and spari, and the whole head is scaly. Many of them have their pharyngeal teeth "*en forme de pavé*," like the labri; but they differ from the labri in wanting the double lips, and in having cæcal appendages to the pylorus. Their air-bladder is very large, and is furnished, in many of the species, with appendages of very curious forms. The presence or absence of canine teeth, the form of the snout, and the existence or want of barbels on the lower jaw, serve to characterise the minor divisions of the first series. The *second series* is composed of genera which have a single continuous or very slightly-notched dorsal. They differ more from each other than those of the first series, and it is among them chiefly that combinations of characters analogous to those of the Percoideæ occur. Three genera, having seven gill-rays, constitute one subdivision, and are distinguished from each other by the number of pores on the lower jaw, or the presence or absence of scales on the vertical fins. Another subdivision, comprising the Sciænoideæ with fewer than seven rays in the gill-membrane, is broken into smaller groups, which are characterised by the form of the lateral line, according as it is continuous or interrupted, or by the presence or absence of simple rays in the pectorals, and by the preoperculum being smooth or toothed.

The Cottoideæ, notwithstanding the peculiarity of their mailed cheeks, form the connecting link between the Percoideæ and Sciænoideæ. Thus the cottoid *Sebastes* are so like the percoid *Serrani* in form, as to be often mistaken for them, and the *Scorpænæ* and *Sebastes* have palatine teeth like the Percoideæ; while other Cottoideæ, the *Synanceiæ* for example, have the smooth palates of the Sciænoideæ.

When we speak of the families in reference to the distribution of the majority of their forms and species, the Percoideæ may be considered as belonging principally to the South Sea and Indian Ocean, the Cottoideæ, as affecting the higher northern latitudes, and the Sciænoideæ as being more peculiarly an American family, for more than one-third of the genera are proper to the Atlantic shores of that continent, and there are only eight of the thirty\* which compose the family that have not one or more species there. The genera peculiar to America are, *Ancylodon*, *Nebris*, *Lepipterus*, *Boridia*, *Conodon*, and *Eques*, inhabiting the intertropical districts, and *Leiostomus*, *Pogonias*, *Micropogon*, and *Hæmulon*, common to them and the seas of the United States: all these have two dorsals and

\* Cuvier includes thirty-one genera in the family, but the origin of *Lonchurus*, which consists of one, or perhaps two, species, is unknown. *Eleginus*, a genus of the Indian and South seas, and one of the eight which have no representative on the Atlantic side of America, has a species on the coast of Chili.

seven branchiostegous rays. *Scolopsides*, *Amphiprion*, *Premnas*, *Dascyllus*, and *Etropus*, which are peculiar to the Red Sea, Indian Ocean, and Polynesia, have one continuous dorsal, and fewer than seven gill-rays. *Diagramma* and *Pomacentrus*, which have also seventeen or eighteen species each in these seas, have also a single dorsal, but the former has seven gill-rays. *Maquaria*, containing a solitary species which inhabits the Macquarie, a river of New Holland, belongs to the same subdivision with the genera peculiar to the Polynesian seas. We have enumerated eighteen genera, twelve only remain, and of these *Sciæna*, *Otolithus*, *Corvina*, *Umbrina*, and *Pristipoma*, typical forms of the Sciænoideæ that have seven gill-rays, and all but the last, having a double dorsal, are the most widely diffused, as the subjoined table shows. *Glyphisodon* and *Heliases*, which have the widest distribution among the genera with fewer than seven gill-rays, have smooth preopercula, and are aberrant forms leading to the Sparoideæ, or in some points of view to the Labroideæ.

GENERA.		Mediterranean Sea.	European Atlantic and Madeira Seas.	African Atlantic.	Cape of Good Hope to Madagascar.	Caribbean Sea and South American Atlantic.	North American Atlantic.	Red Sea, Indian Ocean, and Polynesia.	South Australian Sea and New Zealand.	Sea of Japan.	Sea of Chili.	Totals of Species.
I.	<i>Sciæna</i> . . . . .	1	1	-	1	-	-	1	-	-	-	3
	<i>Otolithus</i> . . . . .	-	-	1	1	8	2	5	-	-	-	15
	<i>Ancylodon</i> . . . . .	-	-	-	-	2	-	-	-	-	-	2
	<i>Corvina</i> . . . . .	1	-	4	-	4	4	19	-	1	-	31
	<i>Leiostomus</i> . . . . .	-	-	-	-	1	1	-	-	-	-	2
	<i>Larimus</i> . . . . .	-	-	1	-	1	-	-	-	-	-	2
	<i>Nebria</i> . . . . .	-	-	-	-	1	-	-	-	-	-	1
	<i>Lepipterus</i> . . . . .	-	-	-	-	1	-	-	-	-	-	1
	<i>Boridia</i> . . . . .	-	-	-	-	1	-	-	-	-	-	1
	<i>Conodon</i> . . . . .	-	-	-	-	1	-	-	-	-	-	1
	<i>Eleginus</i> . . . . .	-	-	-	-	-	-	1	1	-	1	3
	<i>Eques</i> . . . . .	-	-	-	-	3	-	-	-	-	-	3
	<i>Umbrina</i> . . . . .	1	1	-	-	4	1	4	-	-	-	10
	<i>Pogonias</i> . . . . .	-	-	-	-	2	2	-	-	-	-	2
	<i>Micropogon</i> . . . . .	-	-	-	-	3	2	-	-	-	-	3
II.	<i>Hæmulon</i> . . . . .	-	-	-	-	11	2	-	-	-	-	13
	<i>Pristipoma</i> . . . . .	-	-	7	1	11	1	13	-	1	1	35
	<i>Diagramma</i> . . . . .	-	-	-	-	1	-	18	-	1	-	20
	<i>Lobotes</i> . . . . .	-	-	-	-	2	1	2	-	-	-	4
	<i>Scolopsides</i> . . . . .	-	-	-	-	-	-	19	-	-	-	19
	<i>Cheilodactylus</i> . . . . .	-	-	-	2	1	-	-	1	1	3	7
	<i>Latilus</i> . . . . .	-	-	-	-	1	-	2	-	-	1	4
III.	<i>Maquaria</i> . . . . .	-	-	-	-	-	-	-	1	-	-	1
	<i>Amphiprion</i> . . . . .	-	-	-	-	-	-	13	-	-	-	13
	<i>Premnas</i> . . . . .	-	-	-	-	-	-	3	-	-	-	3
	<i>Pomacentrus</i> . . . . .	-	-	-	-	2	-	17	-	-	-	19
	<i>Dascyllus</i> . . . . .	-	-	-	-	-	-	3	-	-	-	3
	<i>Glyphisodon</i> . . . . .	-	1	1	-	3	-	26	-	-	-	30
	<i>Etropus</i> . . . . .	-	-	-	-	-	-	3	-	-	-	3
	<i>Heliases</i> . . . . .	-	1	-	-	1	-	5	-	-	1	8
Totals.		3	4	14	5	65	17	154	3	4	7	262

Few forms, or even species, exist in the European seas. *Sciæna* and *Umbrina* have each a species common to the Mediterranean and Atlantic coasts of Europe, *Corvina*, one peculiar to the Mediterranean, and *Glyphisodon* and *Heliasés*, one each in the sea of Madeira, making but five European species in all. None of the *Sciænoideæ* appear to have a wide range; none cross the Atlantic, and none are common to that sea and either the Indian or Pacific oceans.

[34.] 1. *SCIÆNA (CORVINA) RICHARDSONII*. (Cuvier.) *The Malasheganè*.

FAMILY, *Sciænoideæ*. GENUS, *Sciæna*. Sub-genus, *Corvina*. CUVIER.  
 Le Corb de Richardson. CUV. et VAL., v., p. 100.  
 Malasheganèh. CREE INDIANS.

PLATE LXXVII.

*Corvina* belongs to the *first series* of the *Sciænoideæ*, or those which have a double dorsal fin and seven branchiostegous rays. We have here followed the *Règne Animal* in considering this series as constituting one large genus, named *Sciæna*, and divided into sub-generic groups, which are raised to the rank of genera in the *Histoire des Poissons*. The characters of the series, or of the extended genus *Sciæna*, are given at some length in a preceding page (61). *Corvina* differs from the sub-genera *Sciæna* and *Otolithus*, in the robust form of its anal spine, and from the latter by a second character, viz., the want of canine teeth: the absence of barbels on the lower jaw distinguishes it from *Umbrina* and *Pogonias*. The teeth of *Corvina* also, when closely examined, present a peculiarity of distribution; they form stripes "*en velours*" on both jaws, but the outer rows, though even and pointed, are stronger than the others. *Boridia* and *Conodon* have the form and other exterior characters of *Corvina*, but differ in the teeth, the latter having a row of conical teeth exterior to the stripe "*en velours*," and *Boridia*, the jaws armed with several rows of short, thick, blunt teeth, which ally it to the *Spa-roideæ*, and render it a connecting link between that family and the *Sciænoideæ*. The form of the air-bladder varies considerably in different species of *Corvina*, being quite simple in some, while in others it sends out horn-like processes which are pointed, branched, or even fringed. The remarkable drum-like noise which the Maigres, or true *Sciænae* have the power of producing, at a considerable depth in the water, has not been ascribed to the *Corvinæ*. In some *Corvinæ* the preoperculum has merely a slightly undulated edge, in others it is denticulated or even

decidedly spiny. By far the greater number of the species are inhabitants of the sea exclusively, some have been observed to enter the rivers of India and Africa, but not to ascend beyond the tidal waters; the two species which occur in our Fauna are inhabitants of fresh water only, being found in the Canadian lakes above the falls of Niagara.

The Malasheganè inhabits Lake Huron. It is taken in the Georgian Bay, on the north side of that lake, during the summer months, in gill-nets set in deep water, or by hooks baited with worms. It feeds much on cray-fish. It is a firm, white, well-tasted fish, but never fat, and requires much boiling. It is called "Sheep's-head" by the Anglo-Canadians, probably for the reason that the same appellation is bestowed on the *Sargus ovis* in the United States, viz., from its having an arched nose, and "some smutty shades of colour on the face\*." I had no opportunity of examining the intestines of the Malasheganè, though I can bear testimony to its excellence as an article of food, in which respect it may be compared to the turbot of Europe. My specimen was prepared by Mr. Todd.

## DESCRIPTION

Of a specimen taken at Penetanguishene, on Lake Huron.

FORM.—*Profile*, exclusive of the short and rather deep strap-shaped tail, irregularly oval: the curve, from the snout to the dorsal fin, is quadrantal and abrupt, the head and shoulders being very prominent. The greatest *depth* is at the attachment of the ventrals, where it exceeds a third of the total length including the caudal. The *head* is rather small, and higher than long; the forehead flattish, the snout short, the lower jaw projecting a little, the mouth cleft nearly as far back as the centre of the orbit, and the lips somewhat flabby and sparingly protrusive, but folding back when closed. *Eyes* lateral, situated more than two diameters of the orbit from the extremity of the snout and one above the mouth: the *irides* are silvery. The *nostrils* are near the eyes, and the anterior opening is the smallest. There are four *pores* beneath the end of the lower jaw, apparently leading to cells in the bone, but none are perceptible on the muzzle, at least in the dried specimen.

TEETH.—The opposing surfaces of both jaws are covered with small, slender, erect, crowded teeth, the exterior row, and a small cluster on the tip of each jaw, being of a larger size, though similar in form: "the outer ones have their points rounded, but from their slenderness they appear acute: there are also two patches of teeth on the upper pharyngeal bones, and two on the lower." Mr. Todd,—(who does not describe their form, though it is probable that they are "*en gros pavés ronds*," as in the nearly allied *C. oscula*.) *Tongue* pointed and smooth.

GILL-COVERS.—The posterior edge of the gill-cover is irregularly curved, the tip of the suboperculum forming a small projecting angle on a line with the upper ray of the pectoral fin.

\* Mitchill.

and there is a rounded lobe about midway between this and the upper angle of the operculum. The preoperculum is broad below, but its upper limb, rising at a right angle, becomes gradually narrower. Its whole free edge, that of the interoperculum, and of the suboperculum anteriorly, are finely denticulated, and the teeth, being the tips of very short marginal ridges, are very conspicuous in the dried specimen. The anterior border of the operculum, to the width of half an inch, is scaleless and marked with fine vertical streaks: the under margin of the bone is concealed by scales, and there is a deep rounded notch on its posterior margin which is also covered by membrane and scales, but a rounded lobe above the notch, and another below, are more evident from their edges being finely ridged and somewhat denticulated: the tip of the suboperculum is closely applied to the lower lobe and passes it a little. The bones lining the posterior edge of the gill-opening are scaleless and have smooth edges: the humeral bone is remarkably large and cavernous, the cavities occupied by a net-work of fibres. There are seven *branchiostegous rays*, all somewhat flattened; the first ray is one inch and a half long, the last one measures above four inches.

**SCALES.**—The whole head except the lips, intermaxillaries, labials, branchiostegous membrane, and anterior border of the operculum, is scaly, the scales varying much in size, small and large being crowded together. The scales of the body are also unequal in size, though mostly very large and strong, particularly on the sides, where their general form is that of a square or rectangle, with the exterior side a little convex, and the two outer corners rounded off: many are somewhat oblique, the lower side being the longest. The smallest scales, excepting those on the fins, are on the humeral bone, and next those on the top of the head and before the dorsal. There are fifty-three or fifty-four scales on the lateral line, exclusive of fourteen or fifteen very small ones on the base of the caudal; and about twenty-eight in a vertical row behind the pectorals, eight of which are above the lateral line. A scale taken from under the posterior third of the first dorsal and beneath the lateral line, is seven lines long by eight and a half wide, and is marked with about ten furrows, which converge towards the centre, but do not meet: the corresponding crenatures are not prominent, the basal edge being nearly a straight line: the middle third of the exterior slightly convex edge is crowded with fine ridges, visible under the lens, and apparently jointed, but the whole edge appears smooth to the naked eye and to the touch. A linear inch measured lengthwise on the sides, includes from three to six scales, according to the place that is chosen. The *lateral line* follows the curve of the back at the distance of one-third of the height of the body, until it comes opposite to the middle of the anal, whence it runs in a straight line through the centre of the tail, and is continued between the middle rays of the caudal for more than half the length of that fin. It is formed by a small tubular ridge which divides, in a radiated manner, on the outer border of the scale, into several irregular winding branchlets. The *anus* is at the commencement of the posterior third of the fish excluding the caudal.

**FINS.**—*Br.* 7; *P.* 15; *V.* 1/5; *D.* 9/—1/18; *A.* 1/7; *C.* 17½.

The *pectorals* taper to a point and are considerably longer than the *ventrals*, or than the rays of any of the other fins. The *ventrals* are attached a little farther back than the *pectorals*, their upper ray being opposite to the under one of the latter, or nearly under the fourth

dorsal spine. The ventral rays are robust: the first is bony, and is about two-thirds of the height of the second, which is the longest, and, like the remainder, repeatedly divided towards the tip. The *first dorsal* commences about a spine's breadth posterior to the tip of the gill-cover, and nearly as much anterior to the pectorals: its rays are very stout, compressed, acute spines; they gradually diminish in height from the fourth or longest to the ninth, which is about one-third as high, but almost equally robust: the fifth equals the second, and the first is very short, obtuse, involved in membrane, and closely applied to the base of the second. The membrane is scoloped between the rays, and is attached to the first ray of the second dorsal for about one-third of its height, the two fins not being distinct but merely separated by a notch. The *second dorsal* is higher than the first: it contains nineteen rays, the first of which is spinous, and is rather more than half the height of the succeeding soft rays, but equals the seventh spine of the first dorsal; the soft rays are forked at the tips. A long process of membrane is prolonged for about two inches beyond the last ray of the second dorsal, in which there are imbedded eleven obtuse cartilages, or rudimentary rays, which increase in length as they are more posterior, from one line to three and a half: they have twelve interspinous bones\*. The base of the dorsal fins is covered with small scales which gradually encroach on the rays as they are more posterior: the two or three first rays of the first dorsal are visible their whole length; but the ninth, and all the rays of the second dorsal, are more than one-third imbedded in the scales; the prolonged membrane of the latter is scaleless. The *anal* is supported by a very robust, tapering, bony ray, deeply grooved behind: there is no short spine anterior to it: the first soft ray is about one-third longer, the remainder decrease gradually in length, the last one being shorter than the bony ray. All the soft rays are repeatedly divided at their summits. The *caudal* terminates evenly, its corners being slightly rounded off: its rays begin to divide below the middle into five or six branches.

COLOUR.—Top of the head and the back greenish-grey, with darker bands descending a short way from the latter: sides ash-grey with silvery tips to the scales: belly cream-yellow.

DIMENSIONS.

	Inches.	Lines.		Inches.	Lines
Length from snout to end of caudal fin	. 23	0	Length of ventrals . . . . .	. 3	3
" " origin of ditto . . . . .	. 19	0	" insertion of 1st dorsal . . . . .	. 4	4
" " end of memb. of 2nd dorsal	17	9	" " 2nd dorsal . . . . .	. 8	8
" " end of anal . . . . .	. 14	6	" naked space between do. and caudal	1	6
" " beginning of ditto . . . . .	. 12	10	" " anal and caudal	4	4
" " anus . . . . .	. 12	0	" longest spine of 1st dorsal . . . . .	. 2	0
" " first ray of 2nd dorsal . . . . .	. 10	6	" " ray 2nd dorsal . . . . .	. 3	2
" " " 1st dorsal . . . . .	. 8	0	" " anal . . . . .	. 3	3
" " tip of gill-cover . . . . .	. 5	10	" central caudal rays . . . . .	. 4	0
" " orbit . . . . .	. 1	8	" exterior ditto . . . . .	. 4	0
" of axis of orbit . . . . .	. 1	0	Breadth of caudal at its base . . . . .	. 2	4
" lower jaw . . . . .	. 2	3½	" " extremity . . . . .	. 5	6
" pectorals . . . . .	. 4	5	Depth of body at the ventrals . . . . .	. 8	0

\* I detected the rudimentary rays by softening the membrane and dissecting it after the specimen was returned to me by Baron Cuvier.

[35.] 2. SCIÆNA (CORVINA) OSCULA. (Le Sueur.) *Le Sueur's Corvina*.

SCIÆNA oscula, LE SUEUR. *Jour. de Sc. Phil.*, ii., p. 252. An. 1822. Pl.  
 Le Corb de Le Sueur (*Corvina oscula*). CUV. et VAL., v., p. 98.

This fish inhabits Lake Erie\*, where the specimens taken by M. Le Sueur had their stomachs filled with fragments of river shells of the genera *Cyclas*, *Paludina*, &c. This fresh-water species resembles the *Corvina nigra* of the Mediterranean in its form, though its nape swells out still more.

Its usual size is about seventeen inches in length, by nearly five in height. There are five pores on the lower jaw, and its pharyngeal teeth are large, round, and flat (*en gros pavés ronds*), serving to bruise the shell-fish on which it feeds. The stomach is a large, round, blind sac, and there are seven thick *cæca* at the pylorus. The intestine is almost as wide as the stomach, but its coats are very thin. The *air-bladder* is very large, without appendages, and is covered with nacre. M. Le Sueur describes the colours of some specimens which he found on the beach, where they had been left by the fishermen, as "bluish-grey on the head and caudal-fin, drawing upon black on the snout and above the eyes, more grey towards the back and above the pectorals: all the other fins are of a lighter grey: there were some red tints on the cheeks, and a yellowish reflection on the sides of the back, tail, and opercula; the abdomen beneath the throat was white." (LE SUEUR, *l. c.*)

[36.] 1. SCIÆNA (OTOLITHUS) REGALIS. (Cuvier.) *The Squeteague*.

FAMILY, Sciænoideæ. GENUS, SCIÆNA. Sub-genus, Otolithus. CUV. *Rég. An.*  
 Scuteog, or Weak-fish. SCHOËFF, *Beschr. einiger Nord, &c.*, viii., p. 169. An. 1778.  
 Johnius regalis, SCHNIDER, *Syst. Ichth. Blochii*, p. 75. An. 1801.  
 Labrus squeteague (*Weak-fish*), MITCHELL, *New York Tr.*, i., p. 396, pl. 2, f. 6. An. 1815.  
 L'Otolithe royal (*Otolithus regalis*). CUV. et VAL., v., p. 67. An. 1830.  
 Squeteague. NARRAGANSET INDIANS. Checouts. MOHEGANS.

The *Otolithi* are distinguished from all † the other Sciænoideæ by the presence of a tooth on each intermaxillary bone much longer and stronger than the others,

\* Cuvier says Lake Ontario, but M. Le Sueur, in the paper above cited, says Lake Erie, which is material, as it cannot ascend thither from the sea, though it may into Lake Ontario.

† *Ancylodon jaculidens* is considered, by Cuvier, as being really an Otolithus with a pointed tail, but differing from the others in the shortness of its snout, and the extreme length of some of its teeth. *A. parvipinnis* resembles the Otolithi also, but differs from them, and also from *A. jaculidens*, not only in the dorsals being very small, but also in their being perfectly separated from each other.

and therefore termed a canine. They resemble the *maigres* in their structure, and especially in the smallness of the anal spine; and have, like that sub-genus, the exterior characters of the Sciænæ in general, the bulging head, the cavernous cranial bones, and the long second dorsal. The pores on the lower jaw either do not exist, or they are so small as to be imperceptible. The air-bladders of those which have been examined possess two pointed horn-like arms, originating laterally and running forwards. The Otolithi inhabit the Indian Ocean and Atlantic coasts of America, one species existing however in the sea of Goree, and another at the Cape of Good Hope. The Indian ones have canines on both jaws, the American species have only the upper canines, and it often happens that one of these is broken, or, from some cause, does not grow. The two African species have smaller-sized canines, and in one, *O. æquidens*, they are so little remarkable that the genus might readily be mistaken.

Dr. Mitchill informs us that the Squeteague "is a fish of a goodly appearance, wholesome and well-tasted, though rather soft. He is taken both by the line and seine, and is brought to the New York market in great numbers during the summer months. He is called *weak-fish*, as some say, because he does not pull very hard after he is hooked; or, as others allege, because labouring men, who are fed upon him, are weak by reason of the deficient nourishment in that kind of food. Certain peculiar noises under water, of a low rumbling or drumming kind, are ascribed, by the fishermen, to the Squeteague. Whether the sounds come from these fishes or not, it is certain, that during their season, only, they may be heard from the bottom of the water, in places frequented by the weak-fish and not elsewhere. The swimming-bladder is convertible into good glue. I have eaten as fine blancmange made from it as from the isinglass of the sturgeon." From the same author we learn, that this fish keeps within the limits of the salt water, never going into fresh streams or ponds. It is known along the whole coast of the United States from Rhode Island to New Orleans, and Lieutenant-Colonel Hamilton Smith has taken it in the *Baie des Chaleurs*, near the mouth of the St. Lawrence.

"Its size is commonly from a foot to fifteen inches, but it often grows larger. One, twenty-seven inches in length by seven in depth, weighed heavier than six pounds. The head and back are brown, with frequently a tinge of greenish; faintly silvery with dusky specks above the lateral line, which gradually disappear on the sides, until on descending to the belly, a clear white prevails from the chin to the tail. The eyes are large and pale yellow." (MITCHILL, *l. c.*) There are two strong canine teeth in the upper jaw, one of which is often broken, the rest of that mandible is armed with a single row of teeth, which are very small but distinct and pointed. The under jaw is also furnished with a row of small teeth which is



doubled anteriorly. The two dorsals are well separated, and the second, as well as the caudal and anal, is in a great part covered with small scales. The lateral line is straight, and is continued to the extremity of the caudal, which is slightly notched. There are four cæcal appendages to the pylorus, which is very near the cardiac orifice of the stomach. The coats of the air-bladder are very thick, soft, and nacreous.

FINS.—*D.* 9/—1/29; *A.* 1/13; *C.* 17; *P.* 16; *V.* 1/5. (*Hist. des Poiss.* \*)

\* Mr. Drummond sent me an Otolithus from New Orleans (*O. Drummondii* nob.), which appears to be quite distinct from *regalis* and *Carolinensis*, the only two species that are mentioned in the *Histoire des Poissons* as frequenting the coasts of the United States. It is more slender than *regalis*, and considerably more so than *Carolinensis*, the height of the body being little more than a sixth of the total length, excluding the caudal. In the length of the head, which is exactly one-fourth of the whole length, including the caudal, it resembles *Carolinensis* and surpasses *regalis*. It differs from the latter in having two distinct rows of small pointed teeth round the upper jaw, the outer row being more widely set. There is only one canine tooth in our specimen, moderately long, slender, and very acute, but rendered very conspicuous by its whiteness. Two very acute flat points, divided by a deep angular notch, show through the integuments of the operculum. The caudal is rounded at the end, and the lateral line runs to the tip of the central rays. There are about sixty-six scales on the lateral line, exclusive of the minute ones, which extend pretty far over the caudal: there are scarcely any scales perceptible on the second dorsal and anal. The spine of the latter is small; being slender and not above one-third of the height of the soft ray which succeeds it. There are many small roundish blackish-brown spots on the back above the lateral line, and on the second dorsal and caudal fins. The back appears to have been dark and the sides and belly silvery. The labials and sub-orbital bones have much nacreous lustre. The total length of the specimen is eleven inches and a half, of which the caudal fin occupies one inch and a half. The last ray of the ventral is divided into four branches to the base.

FINS.—*D.* 9/—1/25; *A.* 1/8; *P.* 16; *V.* 1/5; *C.* 17½.

## SPAROIDEÆ.

GENERA.	Mediterranean.	European Atlantic.	African Atlantic.	Cape of Good Hope to Madagascar.	Caribbean Sea and South American Atlantic.	North American Atlantic.	Red Sea, Indian Ocean, and Polynesia.	South Australian and New Zealand Seas.	Sea of Japan.	Totals of Species.
I. { <i>Sargus</i> . . .	4	1	2	—	6	2	—	—	—	14
{ <i>Charax</i> . . .	1	—	—	—	—	—	—	—	—	1
{ <i>Chrysophrys</i> . . .	2	1	1	4	—	1	11	—	2	20
{ <i>Pagrus</i> . . .	4	—	1	1	—	1	3	—	—	12
{ <i>Pagellus</i> . . .	6	3	1	1	—	—	—	3	—	12
{ <i>Dentex</i> . . .	3	—	1	2	1	—	16	—	2	24
II. { <i>Pentapus</i> . . .	—	—	—	—	—	—	3	2	—	5
{ <i>Lethrinus</i> . . .	—	1	1	—	—	—	40	—	1	43
III. { <i>Cantharus</i> . . .	3	2	1	2	—	—	5	—	—	12
IV. { <i>Box, or Boops</i> . . .	2	2	3	—	—	—	1	—	—	4
{ <i>Oblata</i> . . .	1	—	—	—	—	—	—	1	—	2
{ <i>Scatharus</i> . . .	1	—	—	—	—	—	—	—	—	1
{ <i>Crenidens</i> . . .	—	—	—	—	—	—	1	—	—	1
	27	10	11	10	9	4	80	6	5	150

THIS family is characterised by the oval form of the body, a spiny, undivided, scaleless dorsal, jaws not protractile, a toothless palate, unarmed opercular pieces, gill-rays not exceeding six, and few cæca. It is distinguished from the Sciænoideæ by the unarmed gill-covers and the form of the cranium, which is not cavernous and does not bulge out: from the Chætodontoideæ by the vertical fins not being enveloped in scales; and from the Scomberoideæ by the largeness of the scales on the body. The dentition supplies characters for the division of the family into four tribes, or genera as they are reckoned in the *Règne Animal*. The *first* (*Sparus*) has the sides of the jaws armed with molars, or round teeth like paving stones. The anterior teeth may be either cutting, or conical, or like the pile of velvet, and the molars may be in many rows, or in two, or in a single row, and very small—the sub-genera being characterised by the combination of these various kinds of dentition. The *second tribe*, or genus (*Dentex*), has conical teeth, even on the sides of the jaws, several (two, four, or more) of the anterior ones being longer and more or less hooked, resembling canines. There are also generally narrow strips of card-like, or velvet-like teeth, behind the others. The *third tribe* (*Cantharus*) has the teeth in form of velvet pile only, or in card-like plates. Lastly, the *fourth* (*Boops* and *Oblata*) has the edges of the jaws armed with cutting teeth in a single row, either with or without velvet-like plates behind, or small tubercular teeth, but never accompanied by rounded molars.

The Sparoideæ belong more to the European and Indian or South seas, than to the American side of the Atlantic. Four species, viz., *Sargus ovis*, *S. rhomboidalis*, *Chrysophrys aculeata*, and *Pagrus argyrops*, frequent the coasts of the United States as high as New York; and some of these, it is probable, may range as far north as the British possessions, but we have no evidence of such being the fact. Some of the trivial names by which these fish are known in the United States, such as "*Sheepshead*," or "*Tête de mouton*," are used in the Canadas to designate fish of other families. No one Sparoid species is known to exist on both sides of the Atlantic.

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## MÆNOIDEÆ.

THIS small family has many characters in common with the Sparoideæ, from which, however, it is at once distinguished by the very protractile mouth, and, in some instances, by the presence of teeth on the vomer, or denticulations on the preoperculum. The Mænoideæ have scaly bodies, thoracic ventrals, a single dorsal, clothed with very small scales, from four to seven cæca, and a large air-bladder, which is often forked at its posterior extremity. The mouth, when protuded, forms a tube, whose rounded orifice faces downwards in some genera, and directly forwards in others \*. The teeth are *en velours* on the jaws with, in some cases, two or four small canines: the *Mænæ* have in addition small teeth on the vomer, but in the other genera the roof of the mouth is smooth.

*Gerres aprion*, a species belonging to the Caribbean Sea, ranges as far north as the Carolinas, but none of the family have been taken in a higher latitude. Mr. Couch states, in a memoir published in the Linnæan Transactions, that the *Gerres rhombeus*, a West-Indian species, follows drift-timber to the coast of Cornwall; but in Mr. Yarrell's beautiful and able illustrations of British Ichthyology, the fish that Mr. Couch speaks of is described as a new species of *Serranus* (*S. Couchii*).

GENERA.	Mediterranean.	European Atlantic.	African Atlantic.	Caribbean Sea and South American Atlantic.	North American Atlantic.	Red Sea, Indian Ocean, and Polynesia.	South Australian and New Zealand Seas.	Sea of Peru and Mexican Pacific.	Totals of Species.
<i>Mæna</i> . . . . .	4	-	-	-	-	-	-	-	4
<i>Smaris</i> . . . . .	5	2	1	1	-	1	-	-	10
<i>Cæcio</i> . . . . .	-	-	-	-	-	10	-	-	10
<i>Gerres</i> . . . . .	-	-	1	5	1	8	1	3	18
	9	2	2	6	1	19	1	3	42
<i>Aphareus</i> . . . .	-	-	-	-	-	2	-	-	2

\* The genus *zeus*, and particularly its sub-genus *equala*, among the Scomberoidæ, and *epibulus* among the Labroidæ, as well as some others, have similarly protractile mouths.

## CHÆTODONTOIDÆ.—SQUAMMIPENNÆ.

THE fish composing this family are recognisable, at first sight, by the articulated, and often the spinous portions of their dorsal and anal fins being thickly enveloped in scales, and uniting so gradually with the compressed body that the line of junction becomes almost imperceptible\*. Their intestines are pretty long and the cæca numerous. They are divided into three tribes. In the *first*, comprising the *Chætodontes* of Linnæus, the long, slender, flexible teeth are disposed in several crowded rows on the jaws, like the hairs of a brush; the mouth is small; the palate and tongue are toothless; the gill-opening moderately cleft; and its membrane supported by six rays only. This tribe forms a very natural group of fish, many of which exhibit the most varied and brilliant colours, being, in this respect, not in the least inferior to the most gay and shining of the feathered tribes. The presence or absence of a preopercular spine; the form of the dorsal, whether entire, notched, or double, the extent to which it is scaly, and the elongation of its spines by filaments; the number of anal spines; the form of the body; the size of its scales; the form of the muzzle; protuberances on the head, and some other varieties of structure, furnish characters by which the genera that enter into this tribe are distinguished from each other. The genus *Platax* has a row of cutting teeth exterior to the bristle-like ones, *Psettus* has teeth like the pile of shorn velvet, and both these genera have the toothless palate of the rest of the tribe. The *second tribe* contains two genera with cutting teeth in the jaws, viz., *Pimilepterus*, which has the incisors in a single row, with cutting edges rising vertically from horizontal bases that project backwards and fix them to the jaw: a stripe of velvet-like teeth behind, and also some asperities on the vomer and palate; and *Dipterodon*, of which the only one species that is known has teeth like those of the Sparoid genus *Sargus*: its vomer and palate are smooth. The *third tribe* is characterised by the presence of vomerine and palatine teeth, and by teeth in shorn velvet, or cardlike bands on the jaws. *Scorpiis*, enumerated in this tribe by Cuvier, has a row of strong, cylindrical teeth exterior to those in a velvet-like stripe, and is, in many characters, similar to *Platax*, from which it is separated by the presence of palatine teeth.

\* Some of the *Scianioidea*, the *Nebres*, *Lepipteri*, and *Equites*, for instance, have fins much like those of the *Chætodontoides*, but they have not fins, flexible, bristle-like teeth, and in general they have a protuberant snout and cavernous cranium. The *Hamulona* have also scaly fins, but they are not so thick at the base as to look like a part of the body, so that the general aspect of the fish is very different.

The Chaetodontoideæ belong chiefly to the Indian and South seas: the *Brama Raii*, which abounds in the Mediterranean, and ranges on the Atlantic coast as far north as Denmark, is the only European fish of the family; comparatively few exist in the Caribbean Sea, and only four species range northward to the coasts of the United States; *Ephippus faber* and *gigas* are found as high as New York, and *Holocanthus ciliaris* and *Pimilepterus Boscii* have been taken on the Carolina shores. None are recorded as visiting British America.

GENERA.	Mediterranean.	European Atlantic.	African Atlantic.	Cape of Good Hope west side of Madagascar.	North American Atlantic.	Caribbean Sea and South American Atlantic.	Red Sea, Indian Ocean, and Polynesia.	South Australia and New Zealand.	Sea of Japan.	Pacific coasts of Mexico.	Totals of Species.
Chætodon . .	-	-	-	-	-	3	56	-	2	-	61
Chelmon . .	-	-	-	-	-	-	2	-	-	-	2
Heniochus . .	-	-	-	-	-	-	4	-	-	-	4
Zanclus . .	-	-	-	-	-	-	2	-	-	-	2
Ephippus . .	-	-	1	-	2	2	1	-	-	-	4
Drepane . .	-	-	-	-	-	-	2	-	-	-	2
I. Scætophagus .	-	-	-	-	-	-	3	-	-	-	3
Taurichthys .	-	-	-	-	-	-	2	-	-	-	2
Holocanthus .	-	-	-	1	1	2	19	-	-	-	22
Pomacentrus .	-	-	-	-	-	6	-	-	-	-	6
Platax . . .	-	-	-	-	-	1	12	-	-	-	13
Pættus . . .	-	-	1	-	-	-	2	-	-	-	3
II. Pimilepterus .	-	-	-	1	1	2	6	-	-	-	10
Dipterodon . .	-	-	-	1	-	-	-	-	-	-	1
III. Brama . . .	1	1	-	-	-	-	2	-	-	-	3
Scorpiis . . .	-	-	-	-	-	-	-	1	-	-	1
Pempheris . .	-	-	-	-	-	-	7	-	-	1	8
Toxotes . . .	-	-	-	-	-	-	1	-	-	-	1
	1	1	2	3	4	16	121	1	2	1	148

## ANABASIDEÆ.—PHARYNGIENS LABYRINTHIFORMES.

THIS very remarkable, though small family, offers a curious peculiarity in the structure of the superior pharyngeal bones, which are partly divided into lamina that intercept cells of various forms, capable of containing a certain quantity of water. This apparatus, situated under the cranium, and secluded from the external air by swelling gill-covers which press firmly against the body, furnishes the means of moistening the gills when the fish leaves the water. In fact, fish of this family have the singular habit of occasionally travelling some distance through the grass, and it is said, even of ascending palm-trees, for the purpose of entering the pools of water that collect in their cabbage-like tufts of leaves after a shower.

The genera are distinguished from each other by the form of the ventrals, or of some of the other fins; the presence or absence of denticulations on the sub-orbital bones and opercular pieces; the form of the mouth; and insertion of the teeth. Almost all the species, forty in number, are found in fresh waters, and they are all Asiatic, with the exception of *Spirobranchus*, which exists in the rivers of the Cape of Good Hope, and differs from the rest in possessing palatine teeth. The genera are,

<i>Anabas</i>	.	1	<i>Colisa</i>	.	9	<i>Trichopus</i>	.	1
<i>Helostoma</i>	.	1	<i>Macropodus</i>	.	2	<i>Spirobranchus</i>	.	1
<i>Polyacanthus</i>	.	3	<i>Osphromenus</i>	.	3	<i>Ophiocephalus</i>	.	19

## SCOMBEROIDEÆ.

THERE are few characters that are common to all the fish of this extensive family; but as even the most discordant of its members are connected by a continuous series of intermediate forms, it is impossible to separate them, and there is, indeed, a certain family likeness which extends to all, arising principally from the smallness and thinness of the scales, and the peculiarly soft, smooth aspect of the integuments; the vertical fins are not scaly; the opercular bones are destitute of spines or denticulations; and the pyloric cæca are numerous and often clustered. Most of the Scomberoidæ have the sides of the tail simply keeled, or with the keels covered by scale-like plates which are themselves keeled: many have the last rays of the second dorsal and anal fins detached, forming spurious finlets, as they are termed; others have the spinous rays of the first dorsal destitute of connecting membrane, and capable of moving separately; very generally the caudal is remarkably large and powerful, and the tail tapers greatly and is very muscular; and in the greater part the spinous rays of the anal form a small fin distinct from the soft portion. These characters are not all to be found in any one fish or group, but their various combinations and modifications furnish the means of dividing the family into several tribes, which are capable of being more exactly defined than the family itself.

In the *first tribe*, of which the common mackerel is a typical species, the first dorsal is continuous; but both that fin and the anal are succeeded by spurious finlets, and the tail, though keeled, is unarmed: the body is fusiform, and the vigorous caudal fin gives great natatory power. *Lepidopus* and *Trichiurus* are considered as supplementary to this group\*, though they want not only the spurious finlets, but even all the soft rays of the dorsal: in other respects they closely resemble *Thyrsites* and *Gempylus*, which are legitimate members of the tribe.

In the *Histoire des Poissons*, the small tribe of "Espadons" (*Xiphidæ*) follows next. It is characterised by the elongated form of the snout, resembling the flat blade of a sword, a javelin, or spit. The fish composing it are like the Tunnies in the minuteness of their scales, the keeled tail, the very powerful caudal fin, and in their interior organization. They have a continuous dorsal, the keels of the

\* They are so placed in the *Histoire des Poissons*, but in the *Règne Animal* they form the first tribe of the Tenuioideæ, or *Poissons en ruban*.

tail destitute of scaly plates, teeth like the pile of shorn velvet, and a peculiar structure of the gills.

The *second grand tribe* has the spinous rays of the dorsal standing solitarily without a connecting membrane, so that they can move separately. *Chorinemus* has, in addition to these, spurious finlets behind the dorsal and anal, as in the first tribe. *Rynchobdella* and *Mastacembelus* want the ventrals, and *Notacanthus* has the anal united to the caudal, and all the rays of the dorsal detached from each other.

The *third tribe* has the lateral line armed in part, or for its whole length, but chiefly on the sides of the tail, by keeled or hooked shields, or strong scales. This character, in passing through a succession of genera, becomes gradually less marked, until the armour is reduced to scales so small, that they are remarkable merely when viewed in comparison with the more minute scales of the body. The extensive genus *Caranx* exhibits this kind of armour in the greatest perfection; while *Vomer* may be considered as the type of that section in which it becomes less and less conspicuous.

The *fourth tribe* is not so easily defined as the preceding ones, for though the genera composing it form, by easy transitions, a natural series, there are few positive characters common to them all; so that recourse must be had to negative ones for the limitation of the group, such as the want of spurious finlets, or free spines, on the back, and of keeled scales on the sides of the tail. The genera *Seriola* and *Temnodon* of this tribe have much affinity with *Lichia* of the second tribe; while *Stromateus* has the exterior form of many of the Chætodontoideæ. *Coryphæna* seems to differ widely from both in the compression and vertical height of the head; but *Lampugus* and *Centrolophus* are links which connect it on one side to *Lichia*, and on the other to *Stromateus*.

The habits of the Scomberoidæ are quite in accordance with their great powers of natation: we find among them many fish that pass their lives remote from the land in the middle districts of the ocean, and the family may be termed *pelagic*, with as much propriety as some of the preceding ones have been named after the countries where they most abound. The Bonitos and Dolphins, or *Coryphæna* especially, roam about within the Tropics, pursuing shoals of various kinds of flying fish. Several of the Scomberoidæ (*Coryphæna equisetis*, *C. dolfin*, *C. azorica*, *Lampugus punctulatus*, *Centrolophus crassus*) have been taken in the middle longitudes only of the Atlantic, so that they cannot be said to belong to one continent more than another; and there is a greater number of species that cross the Atlantic belonging to this family than to any preceding one. Among these



are, *Scomber grex*, *Pelamys sarda*, *Trichiurus lepturus*, *Elecate Atlantica*, *Lichia glaucus*, *Caranx carangus*, and *Nomeus Mauriti*. Several not only traverse the Atlantic from side to side, but also range through other seas: thus *Thynnus pelamys* and *Seriola cosmopolita* are known on both sides of the Atlantic and in the Indian Ocean. *Auxis vulgaris*, which is common to the Mediterranean and Caribbean seas, also extends to the Indian Archipelago, if the *Taso* of New Guinea be the same species. *Vomer Brownii* visits both sides of the Atlantic, and also the sea of Peru. Many of the species mentioned above as traversing the Atlantic, exist also in the Mediterranean; and there are several others which have an extensive range in the latter sea, and through the whole eastern side of the Atlantic, though they do not cross to America, such as *Scomber scombrus*, *Lepidopus argyreus*, *Xiphias gladius*, and *Naucrates ductor* \*. *Trachurus saurel* exists in the Mediterranean, and on the east side of the Atlantic, from the English Channel to the Cape of Good Hope: it is also found in the Indian Ocean, and in all parts of the Pacific, but not on the American side of the Atlantic. *Pelamys Chilensis* has been taken on both sides of the Pacific, namely, at Japan and Valparaiso. The genera peculiar to a single district of the ocean may be known by a reference to the subjoined table. They are fewer in proportion than in the preceding families, and mostly contain only a single species. There are very few fresh-water or river-fish in the family. *Rhynchobdella* and *Mastacembelus* inhabit the rivers and ponds of India, one species of the latter existing in a river near Aleppo. *Notacanthus* is supposed to inhabit the rivers of Greenland.

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\* *Xiphias gladius* is enumerated by Dr. Smith in his list of the fish of Massachusetts, but as he has included several other European species in his list, on very insufficient grounds, further evidence is required of its being an American fish.

GENERA.	Mediterranean and Black Sea.	European Atlantic, Azores, & Madeira.	African Atlantic.	Cape of Good Hope to Madagascar.	Greenland Rivers or Seas.	North American Atlantic.	Caribbean Sea and South American Atlantic.	Red Sea, Indian Ocean, and Polynesia.	Sea of Japan.	Seas of Chili and Peru.	South Australia and New Zealand.	Totals of Species.
I. Scomber . . .	3	1	-	3	-	1	-	2	2	-	1	11
Thynnus . . .	4	2	3	-	-	-	4	5	-	-	-	13
Auxis . . .	1	-	-	-	-	-	2	1	-	-	-	2
Pelamys . . .	1	-	1	-	-	1	1	-	1	1	-	2
Cybius . . .	-	-	1	-	-	1	5	6	1	-	1	14
Thyrastes . . .	-	-	1	1	-	-	1	-	-	1	1	5
Gempylus . . .	-	-	2	-	-	-	1	1	-	-	1	5
Lepidopus . . .	1	1	-	1	-	-	-	-	-	-	-	1
Trichiurus . . .	-	-	1	-	-	1	1	3	1	-	-	5
Xiphias . . .	1	1	1	1	-	-	-	-	-	-	-	1
<i>Le Makaira</i> . . .	-	1	-	-	-	-	-	-	-	-	-	1
Tetrapturus . . .	1	-	-	-	-	-	-	1	-	-	-	2
Histiophorus . . .	-	-	2	-	-	-	2	2	-	-	-	4
Naucratus . . .	1	1	1	-	-	1	1	1	-	-	-	2
Elecate . . .	-	-	-	-	-	1	1	4	-	-	-	5
Lichia . . .	3	-	3	1	-	-	1	-	-	-	-	4
Chorinemus . . .	-	-	-	-	-	-	5	12	-	-	-	17
II. Trachinotus . . .	-	-	4	1	-	3	8	10	-	1	-	23
Apolectus . . .	-	-	-	-	-	-	-	1	-	-	-	1
Rhynchobdella . . .	-	-	-	-	-	-	-	1	-	-	-	1
Mastacembelus . . .	1	-	-	-	-	-	-	7	-	-	-	8
Notacanthus . . .	-	-	-	-	1	-	-	-	-	-	-	1
Trachurus . . .	1	1	1	1	-	-	-	1	1	1	1	1
Caranx . . .	4	-	8	-	-	2	11	43	-	-	4	67
Olistis . . .	-	-	-	-	-	-	-	3	-	-	-	3
Seyris . . .	1	-	1	-	-	-	-	1	-	-	-	2
III. Blepharis . . .	-	-	-	-	-	-	2	1	-	-	-	3
Gallichthys . . .	1	-	-	-	-	-	-	2	-	-	-	3
Argyreosus . . .	-	-	-	-	-	1	1	-	-	-	-	1
Vomer . . .	-	-	1	-	-	1	1	-	-	1	-	1
Hymnis . . .	-	-	1	-	-	-	-	-	-	-	-	1
Seriola . . .	2	-	2	1	-	5	4	4	-	-	-	14
Tenanodon . . .	1	-	-	1	-	1	1	-	-	-	-	4
Lactarius . . .	-	-	-	-	-	-	-	1	-	-	-	1
Nomeus . . .	-	-	1	-	-	-	1	1	-	-	-	2
Nauclerus . . .	-	-	4	-	-	-	2	2	-	-	-	6
Porthmeus . . .	-	-	-	1	-	-	-	1	-	-	-	1
Psenes . . .	-	-	-	-	-	-	-	5	-	-	1	5
IV. Coryphæna . . .	1	1	3	-	-	1	6	4	-	-	-	13
Lampugus . . .	3	-	2	-	-	-	2	1	-	-	-	8
Centrolophus . . .	3	2	-	-	-	-	-	-	-	-	-	5
Astrodermus . . .	1	-	-	-	-	-	-	-	-	-	-	1
Pteraclis . . .	-	-	-	-	-	1	-	-	-	-	-	3
Stromateus . . .	1	-	-	-	-	-	-	8	-	1	-	10
Rhombus . . .	-	-	-	-	-	2	3	-	-	-	-	5
Luvarus . . .	1	-	-	-	-	-	-	-	-	-	-	1
Seserinus . . .	1	-	-	-	-	-	-	-	-	-	-	1
Kurtus . . .	-	-	-	-	-	-	-	2	-	-	-	2
Totals	38	11	44	12	1	23	66	139	6	6	10	292

[36.] 1. SCOMBER GREX ET VERNALIS. (Mitchill.) *Chub and Spring Mackerel.*

FAMILY, Scomberoidæ. GENUS, Scomber. CUVIER.

Thimble-eyed, Bull-eyed, or Chub Mackerel (*Scomber grex*), MITCHILL, *New York Tr.*, i., p. 422.

Spring Mackerel (*Scomber vernalis*). IDEM, p. 423.

Le petit Maquereau de l'Atlantique (*S. grex*). CUV. et VAL., viii., p. 45.

Le Maquereau printannier (*S. vernalis*). IDEM, p. 48.

The well-known *Scomber scombrus*, or Common Mackerel, is the type of the first tribe of Scomberoidæ, which is characterized by spurious finlets situated behind a continuous dorsal, a fusiform body, a compact, very taper, keeled but unarmed tail, and a large and powerful caudal fin. The tribe comprises the best-known fish of the family, and those which are most useful to man, viz., the *Scombri*, *Thynni*, and *Orcyni*, that traverse the seas in immense shoals, and form the object of vast and expensive fisheries. The Common Mackerel ranges on the European side of the Atlantic, from Iceland to the Canaries, and penetrates into the Baltic, Mediterranean, and Black seas, but not into the sea of Azof. It wants the air-bladder, but there are two Mediterranean species, *S. pneumatophorus* and *colias*, which possess that viscus, although they are extremely similar to the *scombrus* in external form. Two American mackerel, named *S. grex* and *vernalis* by Dr. Mitchill, also provided with an air-bladder, have precisely the exterior form and number of parts\* of *pneumatophorus*, and even their skeletons exhibit no sensible variations, though there are some differences in the viscera, the stomach of the American fish being shorter, and the length and number of the pyloric cæca greater. The only differences between *S. grex* and *vernalis* seem to be in their size and colour, and they are very probably different ages of the same species. *S. grex* frequents the whole of the Atlantic coast of the United States, the Bermudas, the West Indies, the coast of Brazil, and the Cape of Good Hope. It is highly probable that it also ranges to British North America, for mackerel exist on the coasts of Nova Scotia and Newfoundland, and La Hontan enumerates "*maquereaux comme en Europe*" among the fish taken in the estuary of the St. Lawrence. I have not been able to discover if there be mackerel on the Labrador coast, and have never heard of any having been seen in Hudson's Bay.

\* In *Pneumatophorus*, FINS.—Br. 7; D. 10/—1/11—5 finlets; A. 1/11—5 finlets; C. 17; P. 19; V. 1/5.

Dr. Mitchill describes *S. grex* as about ten inches long, having the back marked with meandering lines of pale and dark green, the green becoming lighter and less mottled towards the lateral line: the rest of the surface exhibits changeable tints like a pigeon's neck, or variegated copper ore. This species occasionally visits the coast of New York in the autumn, as was memorably the case in 1781 and 1813, when the bays, creeks, and coves were literally alive with them, and the markets overloaded.

The same author says, the *S. vernalis* is a very elegant fish, sixteen or seventeen inches long and three deep. Its back is marked transversely by deep-blue curved parallel bands reaching below the lateral line. The intervening spaces are of a paler blue and reddish-brown. The head is bluish with dark spots and shades of green intermixed. The belly is silvery-white and iridescent, and all the hues are beautifully changeable. This fish is caught off the New Jersey capes with the hook, and is brought abundantly to the New York market.

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*Pelamys sarda* and *Cybium maculatum*, also belonging to the first tribe of Scomberoideæ, frequent the coasts of the United States as high as Massachusetts\*, but we have no account of their ranging northwards to the British possessions on that side of the Atlantic. Pennant gives *Xiphias gladius* a place among the American fish, in his Arctic Zoology, for no better reason than because it exists in most other seas; and Cuvier, though he has traced it from the Baltic through the North Sea, and the whole European and African Atlantic, and also in the Mediterranean, never saw an American specimen.

Of the *second tribe* of this family, *Naucrates Noveboracensis*, as the name implies, has been taken on the New York coast. It is most probably, according to the *Histoire des Poissons*, the same species with the *N. ductor* of the Mediterranean and the Tropical Atlantic. *Gasterosteus Canadus* of Linnæus, which Cuvier refers to his *Elecate Atlantica* † (a South American fish that is supposed to range to the Guinea coast), was sent to Linnæus from Carolina, and not from Canada, as its appellation would lead us to suppose. It exists, however, as far north as New York, having been described and figured under the name of *Centronotus spinosus*, or Crab-eater, by Dr. Mitchill, in the New York Transactions (i. p. 149, pl. 3, f. 9). Three species of *Trachinotus* are also found on the coasts of the United States, viz., *T. fuscus*, *argenteus*, and *pampanus*, which also range southwards to the Caribbean Sea and Sea of Brazil.

\* Lieutenant-Colonel H. Smith informs me that Tunnies, most probably belonging to the first of these species, are taken off Cape Cod, and the latter of the two is enumerated among the fish of Massachusetts, by Dr. J. V. C. Smith. Cuvier received specimens of both from New York.

† *Elecate Americana*. *Rég. An.*, ii., p. 203.

[38.] 1. NOTACANTHUS NASUS. (Cuvier.) *Beaked Notacanth.*

FAMILY, Scomberoidæ, CUVIER. GENUS, Notacanthus (*Acanthonotus*), BLOCH.  
*Acanthonotus nasus*. BLOCH, t. 431. SCHNEIDER, *Bloch*, p. 390.  
 Le Notacanthé nez (*Notacanthus nasus*). CUV. et VAL., viii., p. 467.

The genera *Rhynchobdella* and *Mastacembelus*, are arranged in the *Histoire des Poissons* as an appendix to the second tribe of Scomberoidæ, to which they bear nearly the same relation that the Xiphidæ do to the first tribe, by the want of ventrals; and they also, by a singular coincidence, show an analogy to the Xiphidæ, in possessing a somewhat prominent snout. *Notacanthus* resembles these genera in having a series of free spines, unconnected by membrane, in place of a dorsal fin, free spines before the anal, which is long and joins the caudal, small oval scales, and a prominent snout; but it differs from them in having ventrals, and from the rest of the Scomberoidæ in these fins being attached to the abdomen far behind the pectorals. It has also some other extraordinary characters.

Its form is riband-like, being greatly elongated and compressed. The anus is about one-seventh of the total length, nearer to the snout than to the tip of the caudal. There are about eighty rows of scales in a longitudinal line.

FINS.—*Br.* 8; *D.* 10/0; *A.* 13/116; *C.* 8; *P.* 17; *V.* 1/8. (*Hist. des Poiss.*)  
 8; 10/10; *A. & C.* 13/149; 16; 2/10. (*Schneider.*)

There are about thirty cylindrical, slightly-flattened teeth crowded into a single row on each side of the upper jaw, and more slender, pointed, and slightly curved ones in the lower jaw, disposed in three or four rows anteriorly, and in one on the sides. (*Hist. des Poiss.*)

This fish was supposed by Bloch to be an inhabitant of the Indian Ocean; but it is, in fact, the native of a widely-distant country. Fabricius received a specimen from Greenland, and described it under the generic appellation of *Campylodon*. It was found in the winter time, lying dead near a hole in the ice, on one of the rivers of that country, but it was not known whether it had come out of the water by itself, or had been taken and abandoned there by a fisherman.

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Four of the *third tribe* of Scomberoidæ, or those which have the sides of the tail and part, or the whole, of the rest of the lateral line armed with scaly plates, are known to frequent the coasts of the United States; viz., *Caranx punctatus*, *C. chrysos*, *Argyrosus vomer*, and *Vomer Brownii*, but the limit of their range northwards is not ascertained. *Zeus gallus*, L., is mentioned by Fabricius in the

Fauna of Greenland; but, in the first place, it cannot now be determined what the species was to which Linnæus gave that appellation, as in his list of Synonyma he has referred to fish of different genera\*, and from various seas. In the second place, Fabricius did not see the fish himself, but merely learned from the Greenlanders, who called it "Kolliooseuternak," that it was extremely rare, and was furnished with four very long threads or tendrils, two of them placed forwards, and two behind. Cuvier thinks that it may have been the *Lampris guttatus*, which forms the subject of the next article.

The following fish of the *fourth tribe* of Scomberoideæ frequent the Atlantic coasts of the United States:—*Seriola Boscii*, *fasciata*, *leiarachus*, *zonatus*, and *cosmopolita*, *Temnodon saltator*, *Coryphæna Sueurii*, *Pteraclis Carolinus*, and *Rhombus longipinnus* and *cryptosus*.

[39.] 1. ZEUS (LAMPRIS) GUTTATUS. (Retzius.) *The Opah.*

FAMILY, Scomberoideæ, CUVIER. GENUS, ZEUS, LINN. *Sub-genus*, Lampris, RETZIUS.  
*Piscis maculis aureis aspersus, non scriptus.* SIBBALD, *Scotia III.*, t. vi., f. 3. *An.* 1683.  
 A curious fish, &c. BIGLAND and MORTIMER. *Phil. Tr.*, xlvi., p. 518. *An.* 1750.  
 Opah doree. PENN. *Br. Zool.*, iii., p. 299, t. 46.  
 Zeus opah. IDEM, *Arct. Zool. suppl.*, p. 419, No. 102. *An.* 1785.  
 "Zeus guttatus. BRUNNICH in *Nya Samling*, iii., p. 398, t. A."  
 "Lampris guttatus. RETZIUS, *Nya Handl.*, iii., p. 91. *An.* 1799." CUV. *Rég. An.*, ii., p. 211.  
 Zeus luna. SCHNEIDER, *Blochii syst.*, p. 96. *An.* 1801.

The Linnean genus *Zeus*, as restricted by Cuvier, comprehends fish which have a compressed body, a very protractile mouth, small scales, and few and feeble teeth. In the protrusive jaws it resembles the Mænoideæ, and differs from the Scomberoideæ, with which, indeed, it is not connected by many other external characters than the smallness of the scales. It is divisible into several sub-genera, as *Zeus* (Cuv.), in which the spines of the notched dorsal are accompanied by long strips of membrane, and there is a row of forked spines along the base of that fin and of the anal. The type of this sub-genus is the well-known "John Dory" (*jaune dorée*), which has stood high in the estimation of English epicures, since the time that Quin made the discovery of its excellent flavour. A second sub-genus, the *Capros* of Lacépède, contains only the *Zeus aper* of Linnæus, a Mediterranean fish. It has the notched dorsal of the dories, with still more protractile jaws, but wants the forked spines at the bases of the dorsal and anal: its whole body is covered with rough scales. The sub-genus *Equula* contains small fishes,

\* *Gallichthys*, *Argyreomus*, *Vomer*, &c.

many of them inhabitants of the Indian Ocean. They have a single dorsal with many basal spines, the anterior ones sometimes very tall, a compressed body, a very protractile muzzle, and the rims of the back and belly denticulated. The genus *Lampris* of Retzius, or *Chrysotosus* of Lacépède, has also only a single dorsal, with one small spine at the base of its very high anterior rays. The ventrals have ten very long rays, and the lobes of the caudal are also greatly elongated, but all these prolonged fins wear down with age. The sides of the tail are keeled. The *opah*, the only known species, is an inhabitant of the North Sea. Sir George Mackenzie informs us, that it frequents the Iceland seas; and if Cuvier's conjecture, alluded to in a preceding page, be correct, it is an occasional visiter of the Greenland coast. Pennant states that it has been taken at Newfoundland; and Dr. J. V. C. Smith enumerates it among the fish of Massachusetts. It has been several times driven by storms upon the shores of Great Britain, and we have given several references to authors who have noticed it\*. Their descriptions, however, differ in so many particulars, that it excites a doubt whether they had all the same species under examination. Sir Robert Sibbald's figure, which is the earliest, has the high commencement of the dorsal separated from the lower part of the fin by a small space; and Pennant's differs in several respects from that in Griffith's Cuvier. The colours also vary with the describer.

In the *Règne Animal* the body is said to be spotted with white, and the fins to be red. Sir Robert Sibbald calls the spots golden. Dr. Mortimer states the back to be dark blue or violet, and, as well as the bright green sides, to be dotted all over with oblong white spots; the jaws pale red; the nose, gills, and belly silvery; and all the fins bright scarlet. One caught in Torbay is described by Pennant's correspondent as being in general of a vivid transparent scarlet, varnished over with burnished gold, and bespangled with oval silver spots of various sizes. Mr. Harrison, of Newcastle, speaking of another which was cast upon the sands at Blyth, says "all the fins are of a fine scarlet, but the colours and beauty of the rest of the body, which is smooth and covered with almost imperceptible scales, beggars all description; the upper part being a bright green, variegated with whitish spots, and enriched with a shining golden hue, like the splendor of a peacock's feather; this by degrees vanishes in a bright silvery tint, and near the belly the gold again predominates in a lighter ground than on the back." (*Br. Zool.*) This fish attains a great size; the one mentioned above, as being taken in Torbay, was four feet and a half long, two feet and a quarter high, but only four inches thick: it weighed one hundred and forty pounds.

FINS.—*Br.* 6; *P.* 21; *V.* 18; *A.* 36; *C.* 19; *D.* 14/48. (*Schneider.*)

*Br.* 6; *P.* 16; *V.* 16; *A.* 36; *C.* 26; *D.* 56. (*Retzius.*)

\* The following may be added from the *Règne Animal*. *Zeus regius*, BONNAT. *Enc. Ichthyol.*, f. 155. *Zeus imperialis*, SHAW. *Nat. Misc.*, No. 140. *Z. luna*, GMEL. *Scomber pelagicus*, GUNNER, *Mem. de Dronth.*, iv., xii., 1. *Le Cryotose hane*, LACÉP., iv., ix., 3. *Le Poisson de hane*, DUHAMEL, *Sect. iv.*, pl. vi., f. 5.

## TÆNIOIDÆ.

THE publication of the *Histoire des Poissons* having as yet advanced no farther than the Scomberoidæ, we are unable to continue the tables of the geographical distribution of the species; but taking the *Règne Animal* as our guide, we shall give brief notices of the characters of the few remaining families of Acanthopterygii. In the latter work the *Poissons en ruban*, or *Tænioides*, immediately succeed the Scomberoidæ, with which they are nearly connected; indeed, this affinity is considered to be so strong, that *Lepidopus* and *Trichiurus*, which form the first tribe of the Tænioidæ in the *Règne Animal*, are transferred to the Scomberoidæ in the *Histoire des Poissons*. Only four genera remain, and the species they contain have, as the family name denotes, a riband-like form, that is, a greatly elongated body with very flat sides: the scales are very small, the gill-rays are six in number, and the ventrals thoracic. *Gymnetrus* and *Stylephorus* form one tribe, characterised by a small and slightly-cleft mouth. They are distinguished from each other by the shape of the tail, which, in the former, terminates in a little hook, and in the latter is prolonged by a slender cord that exceeds the body in length. *Gymnetrus* is remarkable for the form of its fins, which are very long, and so fragile that they are perfect in young fish only. The anterior rays of the dorsal standing on the nape look like a tall plume; the caudal, which contains few but long rays, rises vertically from the extremity of the tail; the ventrals are also very long, but the anal is wanting: the mouth is very protractile, and is armed with a few small teeth; the lateral line gives origin to a series of small spines which are most prominent on the tail; the cæca are numerous, but there is no air-bladder. Four species of this very curious genus are indicated in the *Règne Animal*, one of them being common to the Mediterranean and North Sea, two proper to the latter, and two to the Indian Ocean. *Stylephorus* contains only one known species, which was taken in the Gulf of Mexico. It had no ventrals, and the caudal fin was shorter than in the preceding genus. Another tribe includes the two remaining genera, which have a short muzzle and an obliquely-cleft mouth. *Cepola* has but two or three non-articulated rays in the long dorsal, which are as flexible as the others; but the ventral spines are pungent. The anal is long like the dorsal, and extends to the base of the caudal: there are six gill rays, conspicuous teeth, some cæca, and an air-bladder. One species is indicated as inha-



biting the Mediterranean, and another the sea of Japan. *Lophotes* contains only a single species, which inhabits the Mediterranean, but is very rarely caught. It has the top of the head elevated by a high bony crest, to which there is articulated a long and strong spine, having a membranous border; the dorsal, continued from this spine to the point of the tail, has short, simple rays, and there is a very small, distinct caudal: the ventrals are scarcely perceptible. The teeth are pointed and widely set.

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SIGANOIDEÆ.—LES THEUTYES.

THIS family, which is peculiar to the warmer districts of the ocean, is as closely allied to the Scomberoideæ as the preceding one; but by other characters, such as the lateral armature of the tail in some genera, or the spine imbedded before the dorsal, in others. In all, the body is compressed, oblong, and surmounted by a single dorsal; the mouth is but slightly, or not at all, protractile; each jaw is armed with a single row of cutting teeth; the palate and tongue are toothless; and the gill-rays are four or five in number. The Siganoideæ live on fuci and other sea-weeds, and their intestines are capacious, in conformity with their herbivorous habits. The genera are few in number. The first, *Siganus*, is distinguished from every other genus of fish by the ventrals having an exterior and interior spine which enclose the soft rays between them. It has an unarmed tail, as has also the genus *Prionon*. *Acanthurus* has a moveable spine on each side of the tail, which is capable of making a wound like a surgeon's lancet, and some of the species have also a brush of coarse hairs on the forepart of the lateral line. *Prionurus* and *Naseus* have fixed cutting laminæ on the sides of the tail, and *Axinurus* has but one of these laminæ on each side; it also differs from the others in its teeth being very slender. *Acanthurus hepatus* is enumerated by Schœpf among the New York fish. There are some other species in the warmer parts of the Atlantic, but the greater part of the family inhabit the Indian and Pacific oceans. The *Acanthurus triostegus*, and four others of that genus, were seen at Otaheite by the naturalists of Captain Beechey's expedition.

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## MUGILOIDÆ.

THE Linnean genus *Mugil* exhibits so many peculiarities of organization, that Cuvier thinks it ought to be considered as a distinct family. The fish composing it have a nearly cylindrical form, large scales, two distinct dorsals, of which the foremost contains only five spinous rays, and ventrals situated a little posterior to the pectorals. The gill-rays are only six in number, the head is slightly depressed, and is protected by large scales or polygonal plates, the snout is very short, and the orifice of the mouth is transverse, with a re-entering angle formed by a keel-like eminence of the lower jaw, fitted to a corresponding depression on the upper one. The teeth are extremely fine, and often nearly imperceptible, but the pharyngeal bones are much developed, and give to the entrance of the œsophagus the form of an angular slit, resembling the orifice of the mouth, through which liquids, or very attenuated food, alone can pass. The stomach is muscular like the gizzard of a fowl, the pyloric cœca are few in number, and the intestine is long and doubled upon itself. The Mulletts are esteemed to be fish of an excellent flavour. They enter bays and the mouths of rivers in large shoals, and have the habit of leaping high out of the water. Six species are noticed in the *Règne Animal*, as inhabitants of the European seas: viz., *M. auratus*, *saltator*, and *labeo*, proper to the Mediterranean; *M. capito* and *chelo*, common to that sea and the *North Atlantic*; and *M. cephalus*, likewise found in the Mediterranean, but ranging through the African Atlantic to the Cape of Good Hope, and existing also in the Red Sea, if it be the same species with the *M. our* of Forskal, as is most probably the case. Five or six species belong to America, which have been confounded by authors under the name of *M. albula*. One of them, *M. lineatus*, frequents the coasts of the United States, where it attains the weight of two pounds and a half. Many species exist in the Indian Ocean, and one was observed in the harbour of Mazatlan, South California, by the naturalists of Captain Beechey's expedition.

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The TETRAGONURUS CUVIERI (*Rossi*), a fish inhabiting the greatest depths of the Mediterranean, is an isolated species, which appears to be the only indication of a peculiar family. It derives its name from two salient ridges on each side of the tail, and in its structure it partly resembles the Mugiloideæ, and partly the Scomberoideæ.

ATHERINA is also a genus which does not associate well with any other. It comprises small fish, whose young assemble in crowded shoals, and are greatly prized for their delicate flavour. They have an elongated body, two dorsals very widely separated, ventrals posterior to the pectorals, a very protractile mouth, which is armed with exceedingly slender teeth, six gill-rays and no cæca. All the known species have a broad silvery stripe on each flank. Four species, hitherto confounded under the name of *A. hepsetus*, exist in the European seas, and there are a considerable number in the Indian, Polynesian, Australian, and American seas. Dr. Mitchill enumerates three among the fish of New York, *A. mordax*, *viridescens*, and *notata*, the latter being the *A. menidia* of Linnæus. They are known by the names of "Silver sides," or "Silver fish."

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#### GOBIOIDEÆ.

THE *Gobioideæ* may be recognised by the slenderness and flexibility of their dorsal rays. They have an uniformly wide intestinal canal, no pyloric cæca, and no air-bladder\*. The family is divided into the following genera:—*Blennius*, *Anarrhichas*, *Gobius*, *Callionymus*, and *Platyptera*.

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[40.] 1. **BLENNIUS (CLINUS) PUNCTATUS.** (Fabr.) *The Akooliakeetsok.*

FAMILY, *Gobioideæ*. GENUS, *Blennius*. *Sub-genus*, *Clinus*, CUVIER.  
*Blennius punctatus*. FABR. *Fauna Græc.*, p. 153, N. 110.  
*Centronotus punctatus*. SCHNEIDER, Bloch, p. 166.  
*Akooliakeetsok*. GREENLANDERS.

The genus **BLENNIUS** has a well-marked character in its jugular ventrals, composed of two rays only. The body is elongated and compressed, the dorsal single, and its rays are almost all simple, though flexible. The skin is covered with mucus. Many of the species are viviparous, and both sexes are provided with a tubercle near the anus. The *Blennies* in general have the habit of swimming in

\* Most of the *Gobies* have a simple air-bladder.

small parties among rocks near the shore, and of leaping about on the strand, being capable of existing for some time out of the water. They are in no repute as articles of food. Eight *sub-genera* are indicated in the *Règne Animal*. The first (*Les Blennies proprement dits*) is characterised by the single row of long, equal, crowded teeth in each jaw, terminated posteriorly, in some species, by a long curved tooth. The head is obtuse, the snout short, and the forehead vertical; the dorsal may be either two-lobed, or almost or altogether even. Most of the species have a barbel over each eye, often in form of a tufted fringe, and many have also a tuft on the temples. In others the superciliary tufts are scarcely perceptible, but the head is surmounted by a membranous crest which swells and reddens in the nuptial season. Others again (*Pholis*, Artedi) have neither crests nor superciliary tufts. Seven species belonging to this sub-genus are particularised in the *Règne Animal* as inhabitants of the European seas: one as belonging to the Indian Ocean, and another to the Sea of Brazil. There are doubtless many other foreign species, and several have been noticed by American naturalists, as inhabitants of the coasts of the United States\*. None are mentioned by authors as frequenting the coasts of British America.

*Myxodes* and *Salarias*, the *second* and *third sub-genera*, differ from the preceding chiefly in the form of the head. The former comprises some non-descript species, and the latter fish of the Indian Ocean. The *fourth sub-genus*, *Clinus*, has several rows of short pointed teeth, the first row being the longest. In some species, which have tufts over the eyes, the foremost rays of the dorsal are separated by a notch from the rest of the fin, or the anterior bit of the fin may be altogether detached, so as to appear like a crest on the back of the head. In others, the dorsal is continuous and even. The species indicated in the *Règne Animal* inhabit the North Sea, the South Atlantic in the vicinity of the Cape of Good Hope, and the Sea of New Zealand. The "akoolia-keetsok" of the Greenlanders belongs to this sub-genus. It inhabits deep waters, and is often found in the stomachs of the *gadi*, *pleuronectes*, and other large fish. The following description of it is abridged from Fabricius.

LENGTH six inches, depth one. BODY thicker than the head, and nearly of equal girth throughout. Snout thin, the jaws equal, the forehead flattish. The dorsal and anal are continued to the caudal fin, the former being joined to it by membrane, but the anal distinct. Skin lubricous with minute imbedded scales. The COLOUR is tawny; the head is dotted with white, the throat, pectorals, and caudal are striped with the same, and there are about seven

\* *Blennius pholis*, MITCHELL. *New York Tr.*, i, p. 374. *B. hertz*, LE SUEUR. *Journ. Ac. Sc. Phil.*, iv, p. 361. *Blennius geminatus*, *B. punctatus*, *Pholis novemlineatus*, and *Ph. quadrifasciatus*, WOOD. *Journ. Ac. Sc. Phil.*, iv, p. 278.

brown streaks on the cheeks. There are five black spots, joined to as many white ones, on the dorsal, and about twelve less conspicuous, and all black, on the anal.

FINS.—*Br.* 7; *D.* 50; *P.* 17; *V.* 4\*; *A.* 38; *C.* 18.

[41.] 2. **BLENNIUS (CLINUS) LUMPENUS.** (Fabr.) *The Lumpen.*

*Blennius cirris subgula pinniformibus quasi bifidis, areolis dorsi transversis.* ARTEDI.

*Syn.*, p. 45.

*Blennius lumpenus.* FABR. *Fauna Grœni.*, p. 151.

Teyarnak. GREENLANDERS.

This is another Greenland species which is considered to be the same with one that exists on the Dutch coast. In calms it reposes on the clayey or sandy bottom of the places it frequents, with its body bent backwards and forwards; at other times it conceals itself among the sea-weed. It spawns among the fuci in the month of July.

DESCRIPTION

Abridged from the *Fauna Grœnlandica.*

LENGTH eleven inches and a quarter, the thickness being scarcely one. Its *body* is round, nearly of equal diameter from the head to the anus, from whence it becomes more lanceolate. *Head* narrower than the body, mouth small, the upper jaw scarcely longer than the lower one. The *ventral* fins are so soft, white, and slender, that they may be readily taken for gular barbels; they contain, however, three rays, the lower of which is the longest, and is divided from the next by a fissure: the upper ray is so small as to be scarcely perceptible. The even *dorsal* occupies the whole back, but is distinct from the obovate *caudal*: its spines curve backwards. The *scales* are small, round, and firmly imbedded in the smooth skin. The back and sides have a palish *colour*, and are marked irregularly with brown spotted circles: the head and pectorals are yellowish, and the belly white, with a yellowish tint behind the anus.

The *fifth sub-genus* of the Blennies is *Cirrhobarba*, which is founded on a single Indian species, having the form of *Clinus*, but teeth like velvet pile, a small barbel over each eye, another at the nostril, three large ones at the extremity of the snout, and eight on the tip of the jaw.

\* *Pinnæ ventrales minutæ quatuor quidem constant radiis mollibus, &c.*

[42.] 1. **BLENNIUS (CENTRONOTUS) GUNNELLUS.** (Linn.) *Spotted Gunnelle.*

FAMILY, Gobioides, CUVIER. GENUS, Blennius, LINN. *Sub-genus*, Centronotus, SCHNEIDER.  
*B. gunnellus.* LINN. *Syst. Nat.*, ed. xiii., i. p. 442. FABR. *Finn. Gron.*, p. 149.  
 Spotted Blenny. PENN., *Br. Zool.*, iii., p. 282.  
 Kurksaunak. GREENLANDERS.

*Centronotus*, the sixth sub-genus of the Blennies, has still smaller ventrals than the rest, these fins being scarcely perceptible, and often consisting of only a single ray. The head is small, the body elongated like the blade of a sword, and the dorsal, which extends the whole length of the back, is sustained throughout by simple rays. The dentition is similar to that of *Clinus*. The Spotted Gunnelle abounds in the European seas, is common in the gulfs and bays of Greenland, and probably frequents the whole American coast down to Newfoundland. Fabricius informs us, that in Greenland it dwells among the sea-weeds which grow near the shore, and that though it swims swiftly, after the manner of an eel, it often becomes a prey to the Bull-heads, *Motellæ*, and other littoral fish, as well as to various sea-birds. It feeds upon marine insects and small crustaceæ. The only American specimen that we have seen was brought from the Labrador coast by Mr. Audubon, and is now in the possession of Mr. Yarrell. From long immersion in rum, in the same jar with some *echini*, it has become totally black, so that a comparison of its markings with those of the European fish cannot be made, and we are also ignorant of its internal structure. In external form, however, it bears a very close resemblance to a number of British specimens belonging to Mr. Yarrell, except that its head is proportionably somewhat longer, and its gill-cover rather more pointed. Fabricius mentions that large specimens taken on the Greenland coast are nine inches long, and that he saw one which measured a foot; but his description agrees so well with the English gunnelle, that there is no ground for believing it to be a distinct species, although the latter does not usually exceed six inches in length.

## DESCRIPTION

Of a Labrador specimen preserved in rum.

**FORM**—elongated, much compressed, particularly posteriorly: *profile* almost linear, the head rather obtuse, the tail slightly lanceolate, its tip, to which the caudal is attached, being rounded. The depth of the *body*, at any point between the nape and midway between the anus and caudal, is about one-eleventh of the total length, excluding the caudal. The *anus* is situated under the thirty-third or thirty-fourth dorsal spine. The *head* forms one-seventh

of the length, is narrow, and tapers to a ridge before the eyes, the tip of the upper jaw being, however, rounded. When the mouth is closed, the under jaw ascends considerably, and the commissure of the lips is at the extremity of the head; but when the under jaw is depressed it is longer than the upper one. The *lips* fold back on the mandibles. The *operculum* is heart-shaped, its apex having a membranous margin which forms the acute tip of the *gill-cover*. *Gill-membranes* united under the isthmus forming a transverse loose flap. A row of *pores* runs along each limb of the lower jaw, round the orbits, up the preoperculum, and across the nape.

**TEETH**—short, erect, and acute merely from their slenderness, disposed in a single row on the sides of the jaws, but aggregated anteriorly into two rows on the lower jaw, and into three in the upper one. There is also a transverse, two-rowed cluster of rather smaller teeth on the vomer, but the palate-bones are smooth.

**SCALES**—minute, not tiled, and in most places scarcely touching, enveloped in the mucus which exudes from the skin. *Lateral line* straight and nearer to the belly than to the back.

**FINS**.—*Br.* 5—5; *D.* 78/; *A.* 2/43; *P.* 12; *V.* 1/1, *C.* 20.

The dorsal fin commences opposite to the tip of the gill-cover, and extends to the caudal, to which it is united by membrane: it is about two lines high throughout; its rays are all spinous and scarcely flexible, with their acute points protruding beyond the membrane. Mr. Yarrell reckons from seventy-six to eighty dorsal rays in the English Gunnelle; but Fabricius enumerates eighty-eight, which is almost the only discrepancy betwixt his description and our fish. The *pectorals* have an acutely lanceolate outline, and are attached opposite to the first dorsal spine. The *ventrals* are very small, and contain one conspicuous spine, with a minute branching ray imbedded in the membrane. They are situated a little before the pectorals. The *anal* commences close to the anus: its two anterior rays are spinous\* and shorter than the others, which are forked and as long as the dorsal spines: the membrane of the anal unites with the cuneiform *caudal*, which is rounded at the end.

**COLOUR**.—Fabricius gives the following account of the Spotted Gunnelle of Greenland. The body is greyish-yellow, with pale yellowish marks on the sides before the anus, and whitish ones behind: there are also twelve white marks with black centres upon the base of the dorsal fin, and as many totally white ones of a smaller size. The fins are yellowish, the anal and forepart of the dorsal being tawny; a black stripe crosses the gill-covers and crown of the head; there is another between the eyes; two white stripes alternate with these; and the throat is white. Mr. Yarrell says, "The uniform dark colour of my American specimen obscures every trace of spots. In the British fish, the black spots of the dorsal fin are partly encircled with a white line; but these markings do not occur on the anal fin, which rather partakes of the mottled alternate dark and light brown of the body."

\* One of Mr. Yarrell's English specimens has two minute spines imbedded in the membrane behind the two ordinary ones at the commencement of the fin. Fabricius enumerates six gill-rays; the Labrador fish appears to me to contain five in each membrane; while Mr. Yarrell says there is "nothing deserving the name of branchiostegous rays beyond four, in either the American or British specimens."—Fabricius's words are:—"Membrana branchiostega, sex quidem radios habet, duas inferiores minutissimos, tamen et facile pretereundos."

## DIMENSIONS

Of the Labrador specimen.

	Inches.	Lines.		Inches.	Lines.
Length from tip of upper jaw to end of caudal	7	4	Length of caudal fin	0	5
" " tip of tail . . . . .	7	0	Depth of body . . . . .	0	8
" " anus . . . . .	3	6			
" " tip of gill-cover . . . . .	0	10½			
" " nape . . . . .	0	7			
" " tip of labial . . . . .	0	4			

The Kamtschatka " BUTTER-FISH," the *Ophidium ocellatum*, or *Blennius ocellatus* of Tilesius (*Mem. de St. Petersb.*, iii., p. 237, t. 8, f. 2), which has six round spots on the dorsal, is considered by Cuvier to be akin to the *Centronoti*. It inhabits the harbour of St. Peter and St. Paul. Tilesius alludes to other species that frequent the sea of Kamtschatka and the vicinity of the Kurile Islands, as having been described by Pallas in his unpublished *Fauna Rossica*.

The PUSTULATED BLENNY, noticed by Pennant in the Supplement to his Arctic Zoology, p. 115, as an inhabitant of the sea of Newfoundland, is said to have a pale, dull, yellow colour, with the whole body spotted in form of pustules; but no character is given by which we can infer that it belongs to any of the preceding sub-genera.

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The *Zoarcès* have no spinous rays whatever; yet Cuvier thinks that they cannot be separated from the Blennies, which they resemble in having an anal tubercle, intestines without cæca, a smooth oblong body, and six gill-rays. Their ventrals are three-rayed, their teeth conical and arranged in one row on the sides of the jaws, but in several rows in front; the palate is toothless. Their vertical fins are united, the dorsal being, however, depressed at its junction with the caudal. The *Z. viviparus*; guffer, or eelpout of the European seas, is about a foot long. The *Z. labrosus* (Mitchill, pl. 1, f. 7), which frequents the coast of New York, attains the length of three feet and a half.

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## [43.] 1. BLENNIUS (ZOARCES?) POLARIS. (Sabine.)

FAMILY, Gobioides. GENUS, Blennius. Sub-genus, Zoarces. CUVIER.  
 Blennius polaris. SABINE. *App. Parry's First Voy.*, p. ccxii.  
 ROSS. (Captain J. C.) *Parry's Polar Voy.*, p. 200.  
 IDEM, *App.*, liii. An. 1835.

On Captain Parry's memorable expedition, which first explored the way into the Polar Sea through Lancaster Sound, a blenny was found on the shore of North Georgia, where it had been left by the tide. We subjoin Captain Sabine's account of this individual, which is not sufficiently minute in the description of the teeth, and some other particulars, to enable us to refer the species positively either to *Zoarces* or to any of the sub-genera. In the want of scales it agrees with *Zoarces*.

"It bears a very near resemblance to the description and figure of *B. viviparus* in Muller's *Zoologia Danica*, but differs in the following particulars: the dorsal fin is united to the anal and caudal: the pectoral is not orbicular, as its length exceeds twice its breadth: the number of the rays fifteen. The teeth, though small, are sufficiently conspicuous to the naked eye: the colour a yellowish ground, lighter under the belly, having eleven large saddle-shaped, brown markings across its back; the middle of these markings being much lighter than the edges; the whole back and sides have a marbled appearance; the yellowish ground, when viewed in a microscope, is thickly sprinkled with minute black specks. No scales were discovered, but they may have possibly been removed with the sand which had adhered to the mucous coating of the skin, and which was washed off. Length seven inches. The upper jaw projects rather more than the plate of the *B. viviparus* in the *Zool. Dan.* Ventral fins of two spines enclosed in a lax skin. This species is distinguished from the *B. lumpenus*, by the union of the dorsal and caudal fins, and by the upper jaw being considerably longer than the lower; and from *B. ocellatus*, *Mem. de Petersb.*, t. 3, pl. 8, f. 2, by the ventral fins, which are wanting in the *ocellatus*, as well as by the absence of the spots on the dorsal fin of the latter.

"*B. imberbis, pinnis anali, caudali, dorsaliqve unitis.*"—SABINE, *l. c.*

Captain James C. Ross, on his recent expedition, took a specimen of this fish from the stomach of a *gadus callarias*, which was caught on the west side of the peninsula of Boothia; and he also discovered it in the Spitzbergen seas, when accompanying Sir Edward Parry on his most adventurous boat excursion over the ice.

[44.] 1. ANARRHICHAS LUPUS. (Linn.) *Common Wolf-fish.*

FAMILY, Gobioideæ, CUVIER. GENUS, Anarrhichas, LINN.  
*Anarrhichas lupus.* FARR. *Fauna Grænl.*, p. 138, No. 97.  
 Keegooteeleek. GREENLANDERS.

Cuvier considers the genus *Anarrhichas* to be so nearly allied to *Blennius*, that the principal difference is in the absence of the ventrals. The dorsal extends from the nape almost to the caudal, and is supported throughout by simple, but not stiff rays. The anal also nearly reaches the caudal, which is rounded as well as the pectorals. The whole body is smooth and slimy. The jaws, vomer, and palate-bones are armed with large bony tubercles which support on their summits little enamelled teeth, but the anterior teeth are conical and longer. There are six gill-rays, and neither cæca nor air-bladder. The fish of this genus being generally of a large size, and furnished with jaws so well armed, are dangerous.

The Common Wolf-fish inhabits the North Sea, being common enough as low as the French coast; and it is not rare in the southern bays of Greenland. Fabricius says that the largest one he saw was two feet long; but in the European seas, according to Gronovius, Cuvier, &c., it reaches the length of seven feet. One, three feet long, weighs about twenty pounds. On the Greenland coast it associates itself with the Common Lump-fish, migrating along with it; that is, retiring from the coast to the deep sea in autumn, and returning again in spring. Its great size and formidable teeth do not protect it from the assaults of the Lump-fish, for the latter, when alarmed for the safety of its offspring, pursues the Wolf-fish, and fastening upon its neck persecutes it to death, at least, such is the account given by Fabricius. It feeds upon crustaceæ and shell-fish, which it breaks in pieces with its teeth. Its motion is serpentine, like that of an eel, and when it is seen reposing in the cleft of a rock its body is undulated. It spawns in May, among the larger sea-weeds, a short way from the shore. It has a hoary colour with a whitish belly, dark head with white specks, and two rows of large blackish lateral spots; but there is considerable variety in the depth of the tints.

FINS.—Br. 7; D. 73/; P. 20; V. 0; A. 45; C. 18. (*Fauna Grænl.*)

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[45.] 2. ANARRHICHAS MINOR. (Olafsen.) *Lesser Wolf-fish.*

"Hlyre (*A. minor*). OLAFSENS og Bjarns, &c. *Ann.* 1772, p. 592, t. xlii."  
*Anarrhichas minor*. FABRICIUS. *Faun. Grænl.*, p. 139.  
 KØSTAK. GREENLANDERS.

This species was seen in Greenland, and described by the Missionary Glahn in the year 1766, but it did not come under the notice of Fabricius. Its teeth are said to be different from those of the preceding species in form and arrangement, and to have a more cartilaginous texture. The fish was first described and figured by Olafsen, in the account of his voyage to Iceland.

FINS.—*D.* 70; *P.* 20; *A.* 44; *C.* 21. (*Fauna Grænl.*)

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**Gobius.** (Linn.) Fish belonging to this genus may be recognised at first sight by the union of their thoracic ventrals, either along their whole length, or merely at their bases, so as to form a single, hollow, and more or less funnel-shaped disk. Their gill-flaps, furnished with five rays only, are generally only slightly open, and, like the blennies, they can live for some time out of the water; they resemble these fish likewise in the structure of the intestines, the presence of the same little protuberance behind the anus, and in some of the species being viviparous. They are fish of a small or middle size, which live among rocks near the shore. Most of them have a simple air-bladder.

There are several sub-genera. *Gobius* (Lacép.) or the *true Gobies*, have the ventrals most completely united, the disk extending even before their bases, where it is margined by a transverse membrane. The species are numerous, many inhabiting the seas of Europe, and some even the fresh waters. Olivi, who studied the manners of one which inhabits the lagoons of Venice, observed that it preferred a clayey bottom, in which it excavated tunnels for its winter retreats. In the spring it selected a place abounding with fuci for its nest, and covering it with the roots of the *Zostera maritima*, he male shut himself up therein to wait for the females, who came in succession to deposit their roe which he fecundates, watches, and defends courageously. From these facts Cuvier judges this goby to be the *phycis* of the ancients, the only fish, says Aristotle, which constructs a nest. *G. bosc* (Lacépède) inhabits the bay of New York\*.

The *Gobioides* of Lacépède differ from the true gobies in the union of the dorsals into a

\* It is the *Gobius alepidotus*, SCHNEIDER, *Bl.*, and the *G. viridi-pallidus*, MITCHELL. *New York Tr.*, p. 379, pl. 1, f. 8.

single fin, and the more lengthened form of the body. The third sub-genus *Tanioides* (Lacépède) contains but one species, which has a very extraordinary aspect. It has the single dorsal of the *Gobioides* with a still longer body. The lower jaw rises before the upper one, which is very short, and both are armed with long hooked teeth. The minute eyes are concealed beneath the skin, and the fish inhabits the muddy bottoms of ponds in the East Indies. A fourth sub-genus *Periophthalmus* (Schn.) contains fish of the Moluccas which have the whole head scaly, and the pectorals also scaly for half their length, so that these fins appear to be supported upon arms. Their gill-openings being still narrower than in the other gobies, these fish can live longer in the air, and they often creep and jump upon the mud to escape from their enemies in the water, or to catch the small craw-fish, which form their principal nourishment. Some of them have a ventral disk like the gobies, others have the ventrals separate almost to their bases. The fifth sub-genus, *Eleotris*, differs from the others in having distinct ventrals and six gill-rays. There are species in the East and West Indies\*, Africa, and the Mediterranean, most of them inhabitants of fresh water, and often of mud.

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**CALLIONYMUS.** (Linn.) The fish of this genus have two remarkable characters in their gill-openings, being restricted to a hole on each side of the nape, and in their ventrals being placed widely apart under the throat, and exceeding the pectorals in size. Their eyes are vertical, their intermaxillaries very protractile, and their preoperculum elongated posteriorly and terminating by spines. Their teeth are small and crowded, but there are none on the palate. They have the tubercle behind the anus, and want the cæca and air-bladder like the blennies. They are pretty fish with a smooth skin, and their first dorsal, which is supported by a few setaceous rays, is often very elevated. There are several species in the European seas, and others in the Indian Ocean. *Trichonotus setigerus* (Schn.) appears to be merely a very elongated *Callionymus*, but the gill-openings are said to be fully cleft. *Callionymus Baicalensis* (*Comephorus*, Lacép.) has wide gill-openings, with seven rays in the membrane, very long pectorals, and, what is a peculiarity in this family, no ventrals. It is thrown up dead from the bottom of Lake Baikal after a storm.

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**PLATYPTERA** contains two East-Indian fish, which have the large and distant ventrals of *Callionymus*, a short depressed head, small mouth, wide gill-openings, large scales, and short dorsals placed far apart.

\* *Eleotris dormitatrix*.

[46.] 1. *CHIRUS MONOPTERYGIUS.* (Cuvier.) *Even-finned Chirus.*

FAMILY, Gobioides? CUVIER. GENUS, Chirus. STELLER.  
*Labrax monopterygius.* PALLAS, *Mém. de Pétersb.*, ii., p. 391, pl. xxiii., f. 1.

The indefatigable Steller discovered two species of fish in the sea of Kamtschatka, and left descriptions of them in manuscript, under the names of *Lebius*, *Chirus* vel *Labrax*, and *Hexagrammos*. Tilesius also saw two in the same seas, one of which he described and figured as the *Hexagrammos Stelleri*, in the *Mémoires de L'Academie des Sciences de St. Pétersburg* for the year 1808. In the mean time Pallas, receiving specimens of six different species from the same quarter, read an account of them in 1809 to the Society just mentioned, under the generic appellation of *Labrax*, which was published in the same volume with Tilesius's papers. Cuvier having appropriated the word *Labrax* to the Basses of the percoid family, distinguishes the present genus, in the *Règne Animal*, by the name of *Chirus*, and attaches it to the Gobioidæ, expressing an opinion, however, that it may prove to be the type of a distinct family. The characters of the genus are,—A pretty long body clothed with ciliated scales; a small unarmed head; a slightly-cleft mouth, furnished with small, conical, unequal teeth; and the spinous rays of the dorsal, which stretches along the whole back, almost always slender. Several rows of pores, resembling or forming so many lateral lines, give a peculiar character to the fish of this genus. Their intestines are destitute of cæcal appendages\*, and some species have superciliary tufts, resembling, in that respect, certain blennies; but their ventrals contain five soft rays as usual.

Pallas says that all the known species live near the craggy shores of Kamtschatka, on the opposite American coast, and round the Kurile and Aleutian islands; but in his accounts of particular species he restricts some of them to certain parts of the Kamtschatka Sea.

*Chirus monopterygius* was taken off the island of Unalashka.

It differs from the other species in its forked tail, and in its perfectly even, unnotched dorsal fin, supported by forty-six rays, which are all simple, setaceous, and flexible, the first twenty being, however, more slender than the rest. The rays of the pectoral and anal are also simple and setaceous. Those of the ventrals and caudal are forked. *Gill-membranes* conjoined and forming a loose flap under the isthmus. *Teeth* small, acute, and crowded on the jaws and

\* Steller describes cæca as we shall mention below.

vomer\*. Scales small, closely tiled, very rough, and ciliated. Very small ones cover the top of the head and opercula. There is one porous row above the lateral line, and two some distance beneath it. In all the species the lateral line is prolonged between the rays of the caudal, and the membrane of that fin is minutely scaly. The scales do not extend to the other fins in this species, though they do in some of the rest.

FINS.—Br. 6; P. 24/; V. 6; A. 24/; C. 17; D. 46/.

DIMENSIONS.					
	Inches.	Lines.		Inches.	Lines.
Total length . . . . .	15	10	Length from dorsal to caudal . . . . .	1	7
Length of head and gill-cover . . . . .	3	0	„ of attachment of anal . . . . .	4	3
„ from tip of snout to dorsal . . . . .	3	5	„ from anal to caudal . . . . .	1	8
„ of attachment of dorsal . . . . .	6	6	„ of lobes of caudal . . . . .	2	3

(Mém. de Pétersb.)

[47.] 2. CHIRUS DECAGRAMMUS. (Cuvier.) *Ten-lined Chirus.*

*Labrax decagrammus.* PALLAS, *Mém. de Pétersb.*, ii., p. 386, t. xxii., f. 2.

This species was taken by Billings off Cape St. Elias.

It is covered with small roughish scales, which are least on the belly, top of the head, and gill-covers: there are also minute scales on the bases of all the fins betwixt the rays. The rows of pores are five on each side, including the lateral line, and one of them is interrupted between the ventrals and middle of the anal. The dorsal is deeply notched in the middle, the twenty rays of its anterior portion being simple, the twenty-four of its posterior one forked. The gill-cover ends in a membranous point. The body is bluish above, the back and sides being marked with pale and dusky blotches: the belly is whitish. The dorsal is spotted, the pectorals yellowish and clouded, and the anal and caudal blackish.

FINS.—Br. 5; P. 24; V. 6; A. 24; C. 16; D. 20/24=44. (Mém. de Pétersb.)

DIMENSIONS.					
	Inches.	Lines.		Inches.	Lines.
Total length . . . . .	13	11	Length of attachment of second part of dorsal . . . . .	4	1
Length of head and gill-cover . . . . .	2	9	„ „ anal . . . . .	4	3
„ from tip of snout to dorsal . . . . .	3	0	„ from dorsal to caudal . . . . .	1	5
„ of attachment of first part of ditto . . . . .	4	0			

(Mém. de Pétersb.)

\* *Labrax lagocephalus* and *hexagrammus* are also mentioned by Pallas as having teeth on the vomer, as we have rendered the expression *areola palati*; but in the accounts of the other species maxillary teeth only are noticed. Tilesius's figure of *Hexagrammus Stelleri* represents the vomer and palate smooth, and two crowded groups of teeth on the upper pharyngeal bones. Pallas speaking of *C. hexagrammus* says, "*Areola palati itidem asperata*," which refers to the vomer, and not to the palate-bones, as is evident from Steller's more precise language: "*palato medio non procul a labiis pariter areola denticellis obsita est, ut et tuberculum imo ori denticulatum supra gulam ipsam.*"

[48.] 3. *CHIRUS OCTOGRAMMUS*. (Cuvier.) *Eight-lined Chirus*.

*Labrax octogrammus*. PALLAS, *Mém. de Pétersb.*, ii., p. 393, t. xxiii, f. 2.

This species abounds on the eastern coast of Kamtschatka, and also among the Aleutian Islands. It is named *Terpugh*, or "the file," by the Russians, on account of the roughness of its scales, and *Idgajuk* by the Aleutians.

Jaws rough with crowded *teeth*, the anterior ones of the lower jaw a little longer. *Gill-covers* ending in a membranous tip. Gill-membranes separate. *Scales* middle-sized, very finely ciliated, and exceedingly rough. The top of the head, gill-covers, and suborbitals, are covered with minute *scales*, as are also the membranes of the dorsal and caudal. There are two porous lines above the lateral line, and two below, the one next the dorsal fin short and inconspicuous. The *dorsal* is notched, the posterior part being higher than the anterior one, but both are supported by setaceous rays, as is also the anal fin. The rays of the pectorals and caudal are bifid. The colour of the back is olivaceous, and it is thickly dotted, as well as the sides, with brownish spots; the belly is yellowish.

FINS.—*Br.* 5; *P.* 19; *V.* 7; *A.* 24; *C.* 15; *D.* 19/24/ = 43/.

DIMENSIONS.					
	Inches.	Lines.		Inches.	Lines.
Total length . . . . .	15	8	Length from dorsal to caudal . . . . .	1	1½
Length of head and gill-cover . . . . .	3	3	" of attachment of anal . . . . .	4	8
" from tip of snout to dorsal . . . . .	3	5	" from anal to caudal . . . . .	1	7
" of attachment of dorsal . . . . .	6	3			

(*Mém. de Pétersb.*)

[49.] 4. *CHIRUS SUPERCILIOSUS*. (Cuvier.) *Tufted Chirus*.

"*Lebius, Chirus vel Labrax*. STELLER, *Obs. Ichtyol. Mocr.*"

*Labrax superciliosus*. PALLAS, *Mém. de Pétersb.*, ii., p. 388, t. xxii, f. 3.

This species was taken abundantly off Unalashka by Billings, who sent many specimens to Pallas. That author has added to his description, Steller's account of the colours of the recent fish, and also some anatomical observations, which, if there be no mistake as to the identity of the species, are incompatible with the passage in the *Règne Animal*, which denies cæca to this genus. Steller describes sixteen long pyloric cæca, and two shorter ones. He also says that there is no air-bladder, and that the fish feeds upon crabs and worms.

The TUFTED CHIRUS is distinguished by a sub-cartilaginous six-cleft superciliary barbel. In this respect, in the thickness of its fins and skin, as well as in its general habit, Pallas thinks that this species is allied to the Blennies. The scales are small, thin, adhering firmly, and are finely streaked and ciliated. The top of the head and the gill-covers are scaly, but there are no scales on the fins, the caudal excepted. There are two thick porous lines above the lateral line and two below. The dorsal is notched, the rays of the anterior portion being simple, those of the posterior articulated. The rays of the anal are thick and scarcely forked. Colour of the body brownish-olive, with transverse irregular blotches of pale green. The under jaw, throat, and anterior part of the belly, are tawny-yellow. The dorsal is clouded; the pectorals have two broad brown stripes towards their bases, and the anal is marked with about five wavy bands of sea-green.

FINS.—P. 19; V. 5; A. 22; C. 16; D. 20/23=43.

DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Total length	16	7	Length of attachment of anal	4	10
Length of head and gill-cover	3	4	„ from anal to caudal	1	10
„ from tip of snout to dorsal	3	0	„ of caudal	1	11
„ of attachment of first part of ditto	5	0			
„ „ second ditto	4	4			

(Mém. de Pétersb.)

*Chirus lagocephalus* and *hexagrammus* are not mentioned as having been taken on the American coast. The latter is considered by Pallas to be the *Hexagrammos asper* of Steller, and is said to be very frequent during the autumn, in the harbour of St. Peter and St. Paul. Like the *C. octogrammus*, it is named *Terpuck*, on account of the roughness of its scales; and in Pallas's opinion Steller confounded these two species together. In *C. hexagrammus* the dorsal is deeply notched, and the rays of both parts, and also of the anal, are simple and setaceous. Steller describes it as wanting an air-bladder, and having ten or twelve pyloric cæca. The stomach, which was a sac of the size of a pigeon's egg, with the pylorus on the right side, contained Nereides and roe of fishes.

The *Hexagrammos Stelleri* of Tilesius is also called *Terpuck* at Kamtschatka, and is considered by its describer to be the *Hexagrammos asper* of Steller; but it differs from Pallas's figure of that species in having a three or five-cleft superciliary tuft, and indeed from all the species of that naturalist, in the number of its rays and several other particulars. Tilesius's figure was drawn from a living fish, and ought to be more correct than Pallas's, whose specimens were dried, and who may therefore easily have overlooked the superciliary tufts. It deserves to be remarked, however, that the number of rays in Tilesius's figure do not correspond with his own description.

FINS.—Br. 5; P. 19; V. 5; A. 22; C. 17; D. 20/24. *C. lagocephalus*. Pall.  
 6; 17/; 6; 22/; 14; 22/21/. *C. hexagrammus*. Pall.  
 6; 18; 6; 23; 20; 30, 12. *Hexagr. Stelleri*. Tiles.  
 17/; 5; 23; 19; 44/. *Hexagr. asper*. Stell.  
 Mém. de Pétersb.



## BATRACHOIDEÆ.—LES PECTORALES PEDICULÉES.

THIS family is composed of monstrous-looking acanthopterygious fish, whose pectoral fins are supported upon a kind of arm formed of the elongated carpal bones which in some genera perform the functions of hind feet, enabling the fish to creep over sand or mud like small quadrupeds. The ventrals are jugular, and the gill-plates and rays (four, six, or seven) are enveloped in loose skin, which restricts the gill-opening to a small hole. Cutaneous appendages or barbels generally fringe the lips, or whole lower jaw to the pectorals, or even the entire body. The skin, except in some *Batrachi*, is destitute of scales, but is sometimes partially, or even generally, studded with bony tubercles. The skeleton is, for the most part, but imperfectly osseous. The pyloric cæca, when present, which is rarely, are short, and do not exceed two in number. Some genera have an air-bladder, others want it. In almost all there are two distinct dorsals; and in *Lophius* and *Chironectes* an interspinous bone, lying horizontally forwards on the head, supports several moveable free rays, whose summits are often swelled and fleshy, or even foliated or tufted. *Batrachus* has a spiny operculum and suboperculum, and a flat head broader than the body, but not very disproportionate in length: its gill-opening is situated before the ventrals, and it has two dorsals, the anterior one being supported by spinous rays. *Lophius* has a depressed form, and *Chironectes* a compressed one, and both have monstrously large heads, with a small hole behind the pectorals for an opening to the gills. In *Malthe* the head is flat, and greatly lengthened laterally by the projection of the large subopercula. Its gills open by a hole above and behind the arms which support the pectorals.

The Batrachoideæ can live long out of the water, in consequence of the smallness of their gill-openings. The *Chironectes*, in particular, are able, even in warm countries, to pass two or three days in creeping over the land. All the Batrachoideæ conceal themselves in the mud or sand, and lie in wait to take their prey by surprise. Those species which have free rays on the head, with summits resembling worms, are said to move them backwards and forwards for the purpose of enticing small fish within their reach, and hence the name of "fishing-frogs" has been popularly applied to them. The Batrachoideæ exist in the Atlantic, Indian and Pacific oceans. Several inhabit the European seas. *Lophius pisca-*

*torius*\*, *Chironectes lævigatus* (or *Lophius gibbus*, Mitchill), *Malthè vespertilio* (*Loph. vespert.*, Schœpf.), *Batrachus tau* (*Loph. bufu*, Mitch., or *Batr. vernueil*, Le Sueur), *B. variegatus*, Le Sueur, and *Batrachus grunniens* (or *Cottus grunniens*, L. Schœpf.) frequent the sea of New York.

The THUTINAMEG, or *Wind-fish* of Hudson's Bay, which is said to come to the surface in windy weather only, belongs most probably to this family. It is, indeed, referred by Pennant to *Lophius piscatorius*, but on the authority merely of a short notice by Mr. Hutchins. It does not occur in the *Fauna Grœnlandica*.

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[50.] 1. LOPHIUS (MALTHE) CUBIFRONS. (Richardson.) *Square-browed Malthe*.

FAMILY, Batrachoidæ. GENUS, Lophius. LINN. Sub-genus, Malthe. CUV.

The sub-genus Malthe has the following characters assigned to it in the *Règne Animal*. The head much depressed and greatly widened by the jutting out of the elongated subopercula; the eyes far forward; the snout projecting like a small horn; the protractile mouth, of a moderate size under the snout; the gill-membranes sustained by six or seven rays, and opening on the dorsal aspect by a hole above each pectoral; a solitary, small, soft dorsal; the body studded with bony tubercles and furnished along the sides with barbels, but no free rays on the head; neither pyloric cœca nor air-bladder.

Mr. Audubon has very kindly presented to me a fish of this sub-genus, taken on the Labrador coast, which appears to belong to a species hitherto undescribed. I have compared it with the figures of *Malthe vespertilio* (Bl. 110 and Edwards 283), of *M. nasuta* (Seba., i., 74, f. 2), and of *M. stellata* (Krusenstern's Voy., lxi., lower fig.), to all of which it is very dissimilar in the form of the cranium, and particularly of the snout. Three other species are indicated in the *Règne Animal*, which are still unpublished; viz., *M. notata*, *angusta*, and *truncata*. The last of these names is the only one which is in any respect applicable to our new species, in which the forehead may be said to be truncated, instead of gradually narrowing into a projecting snout. I have received no account of the habits of the Square-browed Malthe. Its intestines were filled with small crabs and uni-

\* The *Lophius piscator*, or Bellows-fish, of Mitchill, as far as his description goes, does not appear to differ from the *L. piscatorius* of the European seas. His variety, *foliatus*, is most probably a distinct species.

valve shells, none of them crushed, the shells passing entire, *per anum*, after their inhabitants have been digested.

## DESCRIPTION

Of a specimen taken on the Labrador coast and preserved in rum.

**FORM**—much depressed, the head very wide posteriorly from the spreading of the subopercular bones. The body tapers gradually from behind the pectorals to the caudal fin, becoming at the same time less and less depressed, the extremity of the tail at the insertion of the caudal fin being decidedly compressed. The gill-openings are about midway between the snout and end of the tail, and the anus is halfway between the pectorals and anal fin, or very little posterior to the gill-openings. The *head* (excluding the gill-plates), or rather the *cranium*, which is slightly moveable on the spinal column, is not at all disproportioned to the size of the fish; it has a cubical form, and the large eyes, having a perfectly lateral aspect, occupy the anterior halves of its sides. The upper surface of the cranium is flat, slightly hollowed between the orbits, where it is narrower, becomes again wider before them, and arching a little in a longitudinal direction, terminates abruptly and evenly, being supported on each side by a vertical pillar that forms the anterior margin of the orbit. On the edge of the forehead, between the tops of these pillars, there is a rounded knob about the size of a grain of duck-shot, coarsely granulated like the rest of the skin, and very unlike the tapering, acute snouts of *M. vespertilio*, *nasuta*, or even *stellata*. Beneath the knob-like snout, and between the shafts of the pillars above mentioned, there is a deep circular cavity, which is lined by a whitish membrane. A canal capable of receiving a crow-quill passes from the bottom of the cavity between the orbits to the back part of the cranium. From under the orifice of the canal there proceeds a long barbel, composed of a bony ray with a thickened tip and a coating of soft skin: it is apparently capable of being protruded from the cavity, or retracted within it, at the pleasure of the fish. The nostrils open by two small orifices before the base of each of the orbital pillars. The *mouth* is situated directly under the anterior margin of the forehead when it is closed, and from the lower jaw inclining upwards the commissure of the lips has then a crescentic form; but when the mouth is open the descent of the lower jaw causes the intermaxillaries to advance on their pedicles, so that its orifice, which is then circular and about equal in diameter to one of the orbits, is protruded beyond the snout. The *labials* lie in the membrane behind the intermaxillaries.

**TEETH**—like very fine shorn velvet, cover the opposing surfaces of the intermaxillaries and lower jaw, the whole upper surface of the tongue, a broad rectangular plate on the vomer, a smaller contiguous plate on each palate bone, and four convex plates on the upper side of the gullet—the pharyngeal teeth being rather coarser than the others.

**GILL-COVERS.**—The very thick, nearly semicylindrical *suboperculum* extends from the cheek to the middle of the arm that supports the pectoral fin, rendering that part of the fish much wider than the body. The thin, flat, nearly horizontal *operculum*, fills part of the space between the suboperculum and the spine. The *gill-opening* is a small round hole, situated between the arm of the pectoral and the spine, and opposite to the extremity of the suboperculum.

The SKIN is every where closely covered with rough roundish grains, which are much smaller on the under surface of the fish. On the dorsal aspect of the head and body there are also many scattered, conical, granulated, bony tubercles, the largest being about the size of a split pea, occupying the middle of the back, and the roughest ones margining the sides of the tail. There are no vestiges of any barbels on the sides of the head or body.

FINS.—*D.* 5; *C.* 9; *A.* 4; *V.* 5; *P.* 11.

The rays of the fins are with difficulty discernible through the thick and partially granulated skin which envelops them. They are all articulated. The *pectorals* have a fan-like form; their rays, which are jointed but undivided, being about equal in length to their carpal elongation or arm. The *ventrals*, attached opposite to the middle of the preoperculum, are dilated and truncated at their ends. The *anal* fin is far back, and is about half the size of the *ventrals*: all its rays are articulated. The *dorsal* very small, and situated a little posterior to the anus, but a considerable distance before the anal fin contains five undivided rays, all articulated at the tips. The *caudal* is rounded at the end: its rays are forked and project a little beyond the membrane.

COLOUR.—The specimen has been so long immersed in rum, that its original colour cannot be determined. At present, its upper surface is greyish-white, with some brown blotches, as if of dirt, adhering to the grained skin. The caudal and pectorals are whitish, with small round brown spots. The under surface of the body is uniformly greyish-white.

INTESTINES.—The stomach is a thin bag, an inch and a half long by an inch wide; the pylorus much contracted, being at one side of the fundus; the rest of the gut is delicate, having a diameter of about a quarter of an inch, and a length exceeding thrice that of the fish, being twice doubled upon itself. There are neither cæca nor air-bladder. The *liver* is large and oily.

DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from frontal tubercle to tip of caudal	7	8	Diameter of orbit . . . . .	0	7
" " base of caudal . . . . .	6	5	" orifice of mouth . . . . .	0	6
" " dorsal . . . . .	4	0	Distance of ditto beneath snout . . . . .	0	3
" " gill-openings . . . . .	3	2	Length of intermaxillary . . . . .	0	6
" " tip of suboperculum . . . . .	3	2½	" labials . . . . .	0	7
" tip of under jaw to tip of caudal	7	6	" limb of under jaw . . . . .	0	7
" " anal fin . . . . .	4	10	" subopercular bone . . . . .	2	3
" " anus . . . . .	3	4	" rays of pectorals . . . . .	1	3
" " ventrals . . . . .	1	10	" " caudal . . . . .	1	5
" " base of rays of			" " ventrals . . . . .	1	3
pectorals . . . . .	4	10	" " anal . . . . .	0	10
" " tips of ditto . . . . .	5	0	" stomach . . . . .	1	6
			" of small intestines . . . . .	24	0

## LABROIDEÆ.

THE fish of this family are readily recognisable by their general aspect, their oblong scaly body, and single dorsal, whose anterior rays are spinous, with often a shred of membrane attached to them. Their pharyngeal bones are armed with teeth stronger than usual, but varying in form in the different genera. They have a strong air-bladder, and either no cæca or only two very small ones. The Linnæan genus *Labrus* forms a group which is distinguished by having one set of lips attached to the sub-orbitals, and another to the jaws, close gill-membranes supported by five rays, conical jaw teeth, the anterior and middle ones longest, and pharyngeal teeth in form of paving stones. The minor groups are characterised by combinations of several varieties of structure, such as the smoothness or scaliness of the head, the presence of denticulations on the preoperculum, the protractility of the mouth, which, in several sub-genera, can be projected in a tubular form, so as to seize small fish that are swimming within its reach, the straight or broken lateral line, the encroachment of the scales on the caudal, or even on the other vertical fins, as in the Chætodontoideæ, the prolongation of the first dorsal rays by long filaments, and some differences in the dentition. In the sub-genus *Anampses* the jaws are armed with only two flat teeth, which project from the mouth and curve outwards. The genus *Xirichthys* differs from *Labrus* chiefly in its very compressed form and the vertical profile of the head: it has large scales and an interrupted lateral line. *Chromis* resembles *Labrus* except in the jaw and pharyngeal teeth being in card-like plates, the vertical fins filamentous, and the lateral line interrupted. *Cychla* has all the teeth like velvet pile and in broad stripes. *Plesiops* differs from *Chromis* in having a compressed head and very long ventrals. *Malacanthus*, with the general characters and jaw teeth of *Labrus*, has the pharyngeal teeth of *Chromis*, the operculum ending in a small spine, and a long dorsal in which the spines are very few, slender, and flexible. *Scarus* is remarkable for convex jaws covered anteriorly and on their edges with teeth like scales. The pharyngeal teeth are in transverse plates, the sub-orbital lips of the preceding genera are wanting, there being only those on the jaws, the scales are large and the lateral line interrupted. *Calliodon* and *Odax*, with some of the characters of *Scarus*, have others more closely resembling *Labrus*.

Many of the Labroideæ are remarkable for the intensity and purity, as well as

brilliance of their colours. They are very generally distributed, being found in all parts of the ocean, and also in lakes and rivers. Upwards of forty species exist in the European seas, chiefly in the Mediterranean, though there are several in the North Sea. The following occur on the coast of the United States: *Labrus Americanus* (*L. tautoga*, Mitch.), *Cheilinus radiatus*, *Lachnolaimus suillus*, *Crenilabrus burgall* (*L. chogset*, Mitch.), *Xirichthys psittacus*, *X. lineatus*, and some others.

Fabricius, while sailing along the Greenland coast, saw a fish of a shining blue colour swim past. The Greenlanders named it *Keblernak*, and Fabricius supposes that it may have been the *Labrus exoletus* of Linnæus, a North Sea fish, which is a *Crenilabrus* in Cuvier's system, and is remarkable for having five spines in its anal fin. The sub-genus *Crenilabrus* is distinguished from the true labri solely by having a denticulated preoperculum. Its numerous species were included by Bloch in his genus *Lutjanus*.

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FISTULAROIDEÆ.—LES BOUCHES EN FLUTE.

THIS family is characterised by a long tubular muzzle, formed of the prolonged ethmoid, vomer, preopercular, interopercular, pterygoid, and tympanic bones, at the extremity of which is the mouth, composed as usual of the palate bones, intermaxillaries, labials, and lower jaw. The intestinal canal is either straight and furnished with two cæcal appendages, or destitute of cæca, and twice or thrice doubled upon itself. The air-bladder is in some extremely small, in others of a moderate size, or even very large. The gill-rays are six or seven in number, or only two or three, and very slender. The scales are of a moderate size or small, or even so minute as to be invisible. The forepart of the back is more or less perfectly protected by osseous or scaly plates, which, in some instances, exist also on the flanks. The dorsal is either single and supported, like the anal to which it is opposed, mostly by simple rays, or it is preceded by free spines, or there are two dorsals, the soft one being generally far back. There are two generic groups, *Fistularia*, in which the body is cylindrical, and *Centriscus*, in which it is compressed and oval.

*Fistularia tabaccaria* frequents the coast of the United States, *F. serrata* the West Indies and sea of Brazil, *Centriscus scolopax* inhabits the Mediterranean. Most of the others belong to the Indian Ocean.

The preceding family is the last of that division of the OSSEOUS FISHES which is named *Acanthopterygian*, or *Spiny-finned*, on account of the spinous rays which support the whole of the first dorsal, when there are two of these fins, or the forepart of the fin when there is only one: in some instances all the rays of a solitary dorsal are spinous, and occasionally the spines are free or unconnected by membrane. The anal has also one or more spinous rays, and there is generally one in each ventral. Several genera, however, are admitted into the division, although the spinous character of their fins is very imperfect, and also some which are absolutely destitute of spines\*, because their habits and their anatomical structure, in general, ally them intimately with groups that are decidedly acanthopterygian.

The exposition of Cuvier's system of arrangement occupies more space in the preceding pages, than may appear to be necessary in a local Fauna; but we found it difficult to give, in any other way, correct characters of the various groups of spiny-finned fish which fall within the proper scope of the work, or to exhibit their true situation in the system, without a reference to the intermediate or connecting families. For it happens that this great division, though richer in genera and species than any other, does not admit of being split into orders, its only practicable subdivision being into natural families, which are so intimately linked to each other, that, as Cuvier says, the whole division might be considered as one great family. Owing to this close dependence of one group of acanthopterygii upon another, they are often more readily distinguishable by comparative characters than by positive ones, thus requiring the whole series to be noticed. These remarks are not so applicable to the remaining divisions of the class, and we shall, therefore, in treating of them, greatly restrict our quotations from Cuvier.

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\* *Zoarces* and *mallo* for instance.

## MALACOPTERYGII ABDOMINALES.

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THE *second* division of osseous fishes is named *Malacopterygian*, or *Soft-finned*, because all the rays of the fins are articulated, excepting sometimes the first of the dorsal or pectorals. It can be conveniently divided into three orders, named *Abdominal*, *Jugular*, and *Apodal*, from the position of the ventrals on the hinder part of the belly, their suspension to the humeral bones, or their total absence. The first order, or that in which the ventrals are attached to the belly behind the pectorals, but unconnected with the humeral bones, is the most numerous of the three, and includes most of the fresh-water fish. It contains five families, of which the first is the

### CYPRINOIDEÆ.

FISH of this family are readily distinguishable by their slightly-cleft mouth, furnished with weak and frequently toothless jaws bordered by the intermaxillaries; by their strongly-toothed pharyngeal bones; and by the fewness of their gill-rays. They have a scaly body, no adipose fin, a stomach destitute of a *cul de sac*, and no pyloric cæca. They abound in the fresh waters of all quarters of the world, and are the least carnivorous of fishes. They exist in the arctic regions of the North American continent, as high as the 68th parallel, though it is remarkable that none occur in the *Fauna Grælandica*, nor were any detected on the North Georgian islands, or Boothian peninsula, by the recent expeditions. The following North American species are indicated in the *Règne Animal*:—*Barbus species novæ*; *Labeo cyprinus* (*Catastomus cyprinus*, Le Sueur); *Catastomus*, 17 *species*; *Leuciscus species novæ*; *Pæcilia multilineata*, Le Sueur; *Lebias ellipsoïdea*, Le Sueur; *Fundulus cænicobus*, Valenciennes (*Cobitis heteroclitæ*, Linn., *Mud-fish*, Schœpf.); *Fundulus fasciatus*, Valen. (*Esox pisciculus et zonatus*, Mitch.); *Molinesia latipinna*, Le Sueur; *Cyprinodon flavulus*, Valen. (*Esox flavulus*, Mitch., *Pæcilia majalis*, Schn.); *Cyprinodon ovinus* (*Esox ovinus*, Mitch.). In Dr. Mitchill's paper on the New York fish, we find the following, which are not in the above list: *Cyprinus oblongus*, very probably a *Labeo*;

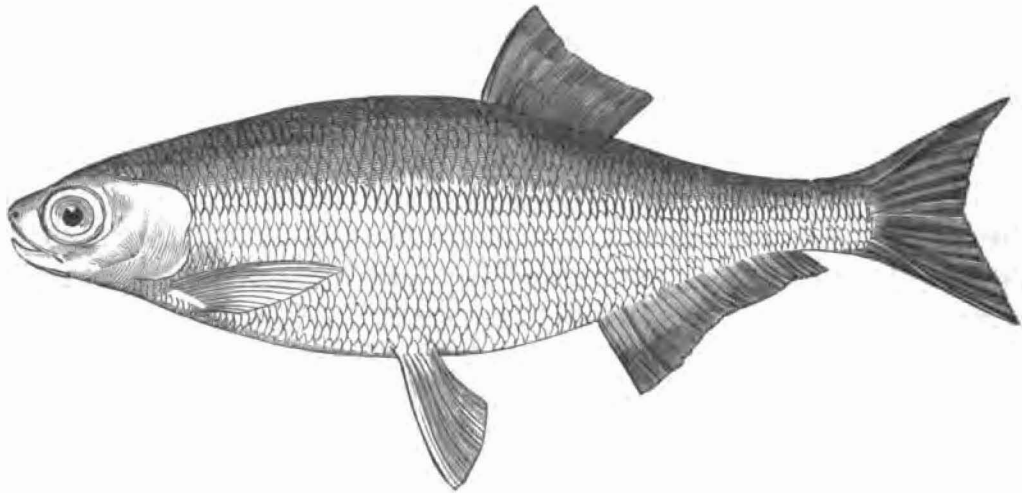


and *C. chrysoleucas* and *atronsus*, which are most likely *Leucisci*. Notwithstanding that Dr. J. V. C. Smith has mentioned as inhabitants of the waters of Massachusetts the Gold-fish of China, and the species so well known to European anglers by the names of Roach, Dace, Bleak, and Chub, we require more circumstantial evidence before we can venture to affirm that any of the *Cyprinoideæ* are common to the Old and New Worlds.

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[51.] 1. *CYPRINUS (ABRAMIS?) SMITHII*. (Nob.) *La Quesche*.

FAMILY, *Cyprinoideæ*. GENUS, *Cyprinus*. *Sub-genus, Abramis*, CUVIER.



The *Cyprini* form a very numerous and extremely natural generic group, and may be easily recognised by the small mouth, toothless jaws, and three flat gill-rays. The tongue is smooth; the palate is lined by a thick and highly-irritable substance, known vulgarly under the name of the carp's tongue; and the gullet exhibits a powerful masticatory apparatus: viz., large teeth attached to the lower pharyngeal bones, and fit for squeezing the aliments against a stony or enamelled disk, which is set in a process of the basiliary bone. The dorsal is single, and the body covered by scales which are often of a great size. The *Cyprini* inhabit fresh waters, and are perhaps the least carnivorous of all fish, living in a great measure on seeds, herbs, or even mud. Their stomach is continuous with the intestine,

which is destitute of cæca, and the air-bladder is divided into two by a contraction. Cuvier distributes the fish of this genus into nine sub-genera, which are distinguished from one another by the extent of the dorsal and anal fins, the spinous or articulated structure of their second rays, the position of the dorsal, the smallness of the scales, the presence of barbels on the upper jaw or angles of the mouth, and the size and form of the lips. The sub-genus *Abramis* is characterised as having a short dorsal situated farther back than the ventrals, and a long anal, but neither spinous rays nor barbels. To this sub-genus I have, for the present, referred the *Quesche* of the Canadians, a cyprinoid fish, of which Lieutenant-Colonel C. H. Smith has sent me a brief notice, accompanied by a drawing, which is copied in the annexed wood-cut\*. In profile, and in the relative size and position of the fins, the *Quesche* bears a resemblance to the common Bream; but one of the rays of its dorsal and anal being spinous, it does not correspond in that respect with the character assigned to *Abramis* by Cuvier; and the size of its anal fin excludes it from the sub-genus which contains the true Carps. The very forward position of the nostrils is unusual, and its toothed tongue is at variance with the definition of the genus *Cyprinus*. Its specific name is intended as a compliment to its highly-talented discoverer.

“ The specimens were taken in the Richelieu, at its confluence with the St. Lawrence, and were all about nine or ten inches long; in form much compressed, the back arched, the dorsal nearer the tail than head, the anal long and oblique, extending to near the caudal fin, which is forked with pointed lobes, the eye very large and near the snout, the nostrils opening on the tip of the latter, the under jaw longest, the tongue toothed, gill-covers round and smooth, lateral line straight, containing sixty scales, scales commencing on the forehead above the eyes, rather large, shining, and pellucid, reflecting a brilliant green on the back, but having a silvery lustre on the sides and abdomen. I do not know in what division to place it, for though it has the form of an *Abramis* it has a spinous ray in the dorsal and anal, and teeth on the tongue.

“ FINS.—*Br.* 3. *P.* 12; *V.* 7; *D.* 1/12; *A.* 1/27; *C.* 18.” (SMITH *in lit.*)

\* The wood-cut is a correct copy of Colonel Smith's sketch except in the scales, which are too small and crowded on the posterior part of the body. There ought to be only sixty scales on the lateral line, as mentioned in the text.

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[52.] 1. CYPRINUS (CATASTOMUS) HUDSONIUS. (Le Sueur.) Grey  
*Sucking-carp.*

FAMILY, Cyprinoidea. GENUS, Cyprinus, CUV. *Sub-genus, Catastomus, LE SUEUR.*  
 Cyprinus catastomus. FORSTER, *Phil. Tr.*, 63, p. 158, t. vi. *An.* 1779.  
 Namaypeeth and Sucker. PENN., *Arct. Zool., Intr.*, p. cccxcix., and ii., p. 402.  
 Catastomus Hudsonius. LE SUEUR, *Ac. Sc. Phil.*, 1., p. 107. RICHARDSON, *Fr. Journ.* p. 717.  
*An.* 1823.  
 Grey Sucker. FUR TRADERS. Carpe blanche. CANADIANS. Namaypeeth. CREES.

In the *Règne Animal* the sub-genus *Catastomus* is characterised as having the same kind of thick, pendent, fringed or crimped lips with *Labeo*; and the short dorsal of *Leuciscus* opposed to the ventrals\*. The species inhabit the fresh waters of North America. The first that we have to notice is the *Grey Sucking-carp*, or *Namaypeeth* of the Cree Indians. It is a common fish in all parts of the fur countries, abounding in the rivers, and even in land-locked marshes and ponds, but preferring shallow grassy lakes with muddy bottoms. In the beginning of summer it may be seen in numbers forcing its way up rocky streams, and even breasting strong rapids, to arrive at its proper spawning places in stony rivulets: soon afterwards it returns to the lakes. Its food, judging from the contents of the stomachs of those which I opened, is chiefly soft insects; but in one I found the fragments of a fresh-water shell. In the winter and autumn it is caught in nets, and in the spawning season (June) may be readily speared, or even taken by the

\* Mr. Le Sueur's account of the genus is as follows:—"Back with a single fin. Gill-membrane three-rayed. Head and opercula smooth. Jaws toothless and retractile. Mouth beneath the snout; lips plaited, lobed, or carunculated, suitable for sucking. Throat with pectinated teeth."—He adds some particulars applicable to the sixteen species which he detected in the waters of the United States. "Scales in almost all marked with radiated lines, and fimbriated on their edges; their form more or less rhomboidal or roundish. Gill-covers large, and composed of three pieces; the anterior one small in some, as in *macrolepidotus*, large in others, as in *communis*: opening wide. Teeth none in the jaws, but those of the throat, on each side, are composed of a range of bones generally blunt and thick at their summits, placed in a pectinated form on an osseous arcuated bone, of which they are a component part, and sometimes terminated in a hooked point as in *maculatus*. The teeth are enveloped in a thick mass of a whitish substance, which covers the throat and supplies the place of a tongue. Mouth generally lunated: to the palate is attached a membrane. Viscera.—The intestinal canal is very much developed, and it has its origin near the throat; the stomach is simple and without plaits or curvatures, being a continuation of this canal, and appearing to be confounded with it. The intestines make a number of convolutions: in a *macrolepidotus*, sixteen inches long, they measured three feet five inches. The liver is deliquescent and soon passes into oil after exposure to the atmosphere. The air-bladder is sub-cylindric and is divided in most species into two parts:—in *macrolepidotus* it is divided into four. In the intestines river-shells (*Lymnea*, *Butimus*, &c.), which dwell on aquatic plants and on rocks or bottoms of rivers, are found. The *Catastomi* are enabled to take these shells by means of their lips, which are protruded forwards by their jaws. It is necessary to remark, that in all the species which I have examined, there is a line that runs from the nape beneath the eyes, and another along the head above the eyes, of small orifices for the passage of mucus; which lines are well defined after the fish is dried and desiccated, but not so conspicuous when recent. Some species also, in a dried state, have a tuberculated appearance on the head, not discernible in the living fish." LE SUEUR, *l. c.*

hand, in shallow streams. It is a very soft watery fish, but devoid of any unpleasant flavour, and is considered to be one of the best in the country for making soup. Like its congeners it is singularly tenacious of life, and may be frozen and thawed again without being killed.

## DESCRIPTION

Drawn up from recent specimens at Cumberland-House, lat. 54°, March 10th, 1820.

**FORM.**—The *head* is smooth, flattened laterally and on the vertex, convex before the eyes, with an obtuse snout: it increases in thickness, gradually, from the nose to the nape, which is broader than the shoulders. The greatest girth of the *body* is about half way to the dorsal fin, from thence it tapers till it passes the anal fin, and the tail is nearly linear: the depth of the body exceeds its thickness rather more than one half. The sides and back are somewhat flattened. The *lateral line* runs equidistant from the back and belly, straight till it comes opposite to the anal fin, when it inclines upwards at a very obtuse angle, and passes along the middle of the tail, giving that member a direction slightly different from that of the body. **SCALES** for the most part broadly oval, or nearly obicular, and of a medium size, being one quarter of an inch in diameter. They are larger towards the tail, and smaller on the belly, particularly between the pectorals. The uncovered portion of each scale is vertically oval, and is marked with diverging lines corresponding to obscure crenatures on the edge.

**HEAD** constituting one-fifth of the total length. The *eyes* are situated about one diameter of their orbit distant from the upper part of the gill-opening, and twice as far from the tip of the snout. The *nostrils* are placed immediately before the eyes; the anterior larger opening has a soft skinny lid which shuts it when thrown forwards, and when turned backwards closes the posterior smaller opening. **GILL-COVERS.**—The *operculum* is thrice the size of the *suboperculum*; their free edges unite into an even elliptical curve. The *interoperculum* has a narrow upright limb connected to the whole anterior edge of the operculum. The *preoperculum*, somewhat crescentic in form, is broader but shorter than the interoperculum, being included within its limbs. Various lines and tubercles, very evident on the head of the dried specimen, are not perceptible in the recent fish, the whole head being covered with a thick, smooth, mucous skin. The brain is protected by a piece of cartilage which, on maceration or boiling, drops out, leaving a rectangular opening before the nape one inch long and a quarter of an inch wide\*.

**MOUTH** retractile, placed under the snout, and capable of being protruded a very little beyond it. *Lips* attached to the intermaxillaries and lower jaw, studded with large soft papillæ, most conspicuous on the lower lip, which is much more developed than the upper one, and expands into two pendulous flaps. The commissure of the closed lips is shaped like a horse-shoe, but when the jaws are extended, the orifice of the mouth is nearly quadrangular, and wide enough to admit the point of the fore-finger. There are no barbels. The *palate*

\* When the head is cooked the brain becomes visible through this opening, and is supposed, by the Indians, to be a small frog, which resides within the head of the fish.

is lined by a thick, gelatinous, light-red membrane, which rises anteriorly into two uvula-like eminences. A furrow which commences between these is closed at the back of the palate by a large pulpy cushion, against which the branchial arches can be pressed. This cushion conceals a number of small bones and cartilages that lie between the extremities of the branchial arches. Attached to the posterior part of the cushion there is a white, firm, cordiform substance, which lines an irregular cribriform plate projecting from the basilar process of the occipital bone. There are no *teeth*, but their place is supplied in the following manner. The two inferior pharyngeal bones have, when united, the form of a horse's hoof, and go nearly two-thirds round the pharynx. From the edge of each bone thirty-six processes spring in a pectinated manner; they are compressed laterally, somewhat chub-shaped, a little worn on their summits, and gradually diminish in size as they recede from the median line: two or three of the lowest and largest project through the very soft lining membrane, exhibiting narrow crowns of a very compact texture resembling enamel: the smaller processes are tipped with soft pulpy rakers, having the form of those on the branchial arches. A strong muscular apparatus surrounding the pharynx, serves to press these parts against the cordiform cushion above mentioned with sufficient force to bruise the substances on which the fish preys. There are no *superior pharyngeal bones*, unless the irregular expansion of the basilar process may be so denominated. The *rakers* consist of a double row of thin and rather rigid crests, with scalloped edges springing from the inner margins of each branchial arch.

FINS.—*Br.* 3—3; *P.* 17; *D.* 12 to 14; *V.* 10; *A.* 7 or 8; *C.* 18½.

The *gill-membranes* are united to each other by a plicated skin, destitute of scales and separated from the integuments of the abdomen by a transverse superficial furrow. They contain on each side three broad flat rays. The *pectoral fins* are elliptical, and contain seventeen crowded rays, of which the first is the strongest, its articulations being scarcely perceptible towards its base, and the fifth or sixth is the longest, the more posterior ones diminishing rapidly in length and strength. The *ventrals*, placed a little nearer to the gill-openings than to the caudal fin, have an obovate outline: their second ray is the strongest; the first, which is half the length of the second and closely applied to it, appears upon a cursory examination to be spinous; but when it is divested of integument, some articulations may be perceived with a lens. The *anal*, extending to within its own length of the caudal, contains eight, or sometimes only seven, thick rays, the first short and scarcely perceptibly articulated; the others divided at the tips. When this fin is turned backwards its tip reaches the base of the caudal. The *caudal* has eighteen rays, with three short ones above and below: its margin is slightly crescentic. The *dorsal* is nearly quadrangular, and contains generally thirteen rays, though some specimens have one over or under that number: the second ray, about half as long as the succeeding one, appears to be spinous, or, at least, its articulations are not perceptible even through a lens: the first is so short as not to be readily discovered, and is closely applied to the second; the other rays are distinctly articulated, except at their bases, and divided twice or thrice at their summits, which spread slightly.

COLOUR.—*Back* and *sides* bluish-grey with considerable lustre, the back being darkest, and

the tint of the sides gradually passing into the pearl-white of the *belly*. *Dorsal* and *caudal* fins bluish-grey: *pectorals* and *ventrals* ochre-yellow tinged with red: *anal* flesh-red. *Irides* saffron-yellow with pearly lustre.

**INTESTINES.**—The *intestinal canal*, in its course from the gullet to the anus, makes four convolutions and a half, and bears a proportion to the length of the fish, excluding the caudal fin, of 50 to 18: the proportions, however, vary a little in different individuals. At the commencement of the canal there is a very short, thick, glandular *œsophagus*, succeeded by a *stomach* whose diameter exceeds that of the rest of the intestine only so much as to leave a gibbosity at what may be termed the pylorus, or first turn of the intestine. From this turn the diameter of the gut, and the strength of its coats, diminish gradually: its inner membrane forms delicate and minute longitudinal wrinkles, waved and indented into each other in a very beautiful manner. There are no *cæca*. The lobes of the *liver* are numerous and greatly involved in the folds of the intestine: the colour of the liver is pale. The *gall-bladder* lies between the intestines and air-bladder: its duct enters the stomach within an inch of the gullet: the *bile* is pale. The *spleen* is large and lies in a semicircular form round the exterior convolution of the intestine. The *air-bladder* extends the whole length of the cavity of the abdomen, and consists of two divisions, united by a very short tube which is bound to the spine by a strong fold of peritonæum: the upper division is the shortest, and is enveloped by a remarkably thick, shining, white capsule, which adheres strongly at its upper end to the spine and septum of the thorax: the bladder may be thrust from its capsule by a slight force. The proper coats of the air-bladder are much thinner, but firmer and stronger than the capsule. A small tube proceeds from the top of the lower division of the air-bladder, but its termination was not traced. The *kidneys*, as long as the cavity of the abdomen, are connected superiorly by a transverse lobe; and the *urinary bladder* is a long tube whose calibre scarcely exceeds the joint diameters of the ureters. The lining of the abdomen is white. Many small *parasitic worms* were found attached by a kind of proboscis to the interior of the intestinal canal.

## DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from end of snout to tips of caudal	21	9	Length of pectorals . . . . .	3	2
"    "    end of scales on ditto . . . . .	18	9	Height of dorsal . . . . .	2	2
"    "    beginning of anal . . . . .	15	6	Length of its attachment . . . . .	3	0
"    "    first ray of ventrals . . . . .	10	7	"    ventrals . . . . .	2	2
"    "    ditto of dorsal . . . . .	9	0	Depth of anal . . . . .	2	11
"    "    edge of gill-cover . . . . .	4	0	Length of its attachment . . . . .	1	4
"    "    nape . . . . .	3	6	Space between it and base of caudal . . . . .	2	1
"    "    centre of orbit . . . . .	2	3	Depth of body before dorsal . . . . .	3	7
Breadth of nape . . . . .	2	2	Weight of recent fish . . . . .	5lbs.	

Dr. Gairdner has forwarded to me from the Columbia and its tributaries several specimens of a *catastomus*, which agrees both externally and internally with the preceding, except in the belly being tinged with ochre-yellow. The stomach of one of them is filled with very young shells, apparently of an *Unio*. There are from 74 to 77 scales on the lateral-line, 46 vertebrae in the spine, and from 15 to 17 rays in the dorsal fin.

[53.] 2. CYPRINUS (CATASTOMUS) FORSTERIANUS. (Rich.) *Red Sucking Carp.*

*Cyprinus catostomus*, var. FORSTER, *Phil. Tr.*, lxiii., p. 158. *An.* 1779.  
*Mithomapeth*. PENN., *Arct. Zool. Litr.*, p. ccxcix.  
*Catostomus Forsterianus*. RICHARDSON, *Fr. Journ.*, p. 720. *An.* 1823.  
 Red Sucker. FUR TRADERS. Meethqua-maypeth. CREES.

This fish is well known in every part of the country that lies north of Canada: we found it in Lake Huron and Great Slave Lake, and north of the latter it exists in greater abundance than the preceding species, which it entirely resembles in its habits. It makes a more gelatinous soup than any other of the northern fish, and is the best bait for trout or pike. It spawns in June. Though Forster has ranked it merely as a variety of the preceding, it is perfectly distinct, both in external appearance and in various internal characters.

DESCRIPTION

Drawn up from recent specimens and revised from prepared ones.

FORM.—The *back* is broader and straighter than in the foregoing species, and the depth of the body is less, being about one-fifth of the length exclusive of the caudal, or scarcely exceeding the thickness: the *back* and *sides* are a little flattened, and the profile tapers gradually from the shoulders to the tail. *Head* contained five times and a half in the total length including the caudal fin: it is not so much compressed as in the foregoing and following species, and the snout is longer and more acute, as well as more moveable. The forehead is straight, not arched, and the anterior margin of the orbit is exactly midway between the tip of the snout and posterior edge of the gill-cover. *Mouth* larger than in *C. Hudsonius* and farther back, the upper lip, when protruded to the utmost, being scarcely even with the end of the snout. The pendulous flaps of the lower lip are also broader, and the papillæ larger. The interior of the mouth and gullet are similar to the same parts in *C. Hudsonius*.

SCALES broadly oblong, their sides parallel, their ends segments of a circle; their surfaces impressed with lines radiating from the centre to all sides; their margins nearly even, instead of being crenated as in *C. Hudsonius*. They are considerably smaller than those of the latter fish, the difference being most apparent in the scales which cover the forepart of the back. Their size increases with their distance from the head, and those on the shoulder are but little larger than those between the pectorals. A scale taken from beneath the lateral line, midway between the pectorals and ventrals, is four lines long and three broad. A linear inch measured on the side near the gill-openings, contains nine scales, seven over the ventrals, and five over the anal. There are from 98 to 107 scales on the lateral line, thirty in a vertical row

behind the pectorals, and twenty-three just before the ventrals. The *lateral line* is straight, making no perceptible angle at the junction of the tail and body.

FINS.—*Br.* 3—3; *P.* 18; *D.* 12 to 14; *V.* 10; *A.* 8 or 9; *C.* 18½.

The height of the *dorsal* exceeds the length of its attachment; and its eighth or ninth ray is opposite to the first of the *ventrals*. The *anal*, when turned back, does not reach quite to the base of the caudal.

COLOUR of the back intermediate between honey-yellow and oil-green (like old olive-oil); the sides are occupied by a series of patches of light lake-red, more or less continuous, forming a broad irregular stripe: the belly is white. The under fins are tinged with ochre-yellow, and at some seasons have a red hue; the dorsal and upper part of the caudal have nearly the tint of the back.

INTESTINES.—The *lining* of the *abdomen* is covered with a pigment similar to that which is attached to the choroid coat of the human eye: it is most abundant on the capsule of the air-bladder, and soils the fingers, but is easily washed off. As it is not present in the foregoing or following species, it forms a convenient distinguishing character. The *air-bladder* is divided into two sacs, the lower of which sends a slender contorted tube to the œsophagus. The *spleen* lies in the centre of the convolutions of the gut. The length of the whole alimentary canal is to that of the fish, excluding the caudal fin, as 47 to 17.

## DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from end of snout to tips of caudal	22	4	Length of ventrals . . . . .	2	9
"  "  end of scales on ditto . . . . .	19	3	"  longest rays of anal . . . . .	3	0
"  "  end of anal . . . . .	16	7	"  its attachment . . . . .	1	3
"  "  anus . . . . .	15	2	"  longest rays of caudal . . . . .	3	5
"  "  ventrals . . . . .	11	3	"  central rays of ditto . . . . .	1	10
"  "  dorsal . . . . .	9	9	Depth of body where greatest . . . . .	3	6
"  "  posterior edge of gill-cover . . . . .	4	0	Circumference there . . . . .	10	0
"  "  nape . . . . .	3	7	Longitudinal axis of orbit . . . . .	0	7
"  "  orbit . . . . .	2	0	Vertical ditto . . . . .	0	6
"  of pectorals . . . . .	3	4	Spread of caudal fin . . . . .	5	0
"  longest rays of dorsal . . . . .	2	3	Length of aliment. canal from gullet to anus . . . . .	47	0
"  its attachment . . . . .	2	2	Weight of recent fish . . . . .	7½	lbs.



[54.] 3. CYPRINUS (CATASTOMUS) SUEURII. (Rich.) *The Picconou.*

Catostomus Le Sueurii\*. RICHARDSON, *Fr. Journ.*, p. 772. An. 1823.  
PICCONOU. VOYAGEURS. WAWPAWHAW-KEESHAW. CREES.

This handsome species was observed by us only in Pine-Island Lake, lat. 54°, long. 110°; but it is not unknown in other parts of the fur-countries, though much more rare than the two preceding species. It may be at once distinguished from them by the size and lustre of its scales and the form of its lips, as well as by the anatomical peculiarity of having its air-bladder divided into three portions. There seems to be considerable variety in the form of the air-bladder in this sub-genus; in *C. macrolepidotus* of *Le Sueur* it has four divisions; but in the majority of the species only two. The habits of the Picconou are the same as those of the preceding species. It spawns in June.

## DESCRIPTION

Of recent specimens at Cumberland House, April, 1820, revised from prepared ones.

COLOUR.—Back, sides, and gill-covers wood-brown, reflecting when opposed to the light many brilliant tints, in which emerald-green and gold-yellow predominate; bases of the scales bluish-grey, producing an appearance of reticulation; belly reddish-white. The dorsal has the hue of the back with a reddish margin, the other fins are almost entirely red.

SCALES large, quadrangular with parallel sides and irregularly curved ends: their length and breadth nearly equal. Except in the pectoral region, where they are small, their size when *in situ* appears nearly the same over the whole body: the vertical height of their uncovered portion considerably exceeds its length. A linear inch measured longitudinally on the sides includes three scales, but vertically only two. There are 47 scales on the lateral-line, and about 10 in a vertical line under the dorsal. A scale detached from near the lateral-line above the ventrals measures eight lines and a half in length, and seven and a half in width. The *lateral-line* turns up decidedly at the anal as in *C. Hudsonius*.

FORM more compressed than in the preceding species. *Profile* oblong, having the greatest height, (which is about one-fourth of the total length, including the caudal,) at the beginning of the dorsal. The *head* is smaller than in either of the preceding species, forming scarcely the sixth of the total length. The very small *mouth* is farther back than in *C. Hudsonius*, being, when the jaws are retracted, an inch behind the tip of the rather narrow snout, and just even with it when they are protruded. The lips, instead of being papillated, are furrowed vertically in a very regular and beautiful manner. The palate and gullet resemble the same parts in *C. Hudsonius*, but are smaller, the comminuting apparatus being more delicate, and the œsophagus remarkably contracted at its origin.

\* The original specific name has been altered by dropping the prefixed article, as being more agreeable to the usual custom.

FINS.—*Br.* 3—3; *P.* 16; *D.* 14; *V.* 9 or 10; *A.* 9; *C.* 18½.

The *dorsal* fin is larger than in the foregoing two species, and is nearly in the middle of the fish. The *pectorals* measure rather less than one-fifth of the distance between the gill-openings and caudal fin. The *ventrals* are under the middle of the dorsal. The tip of the *anal*, when turned back, rather overlaps the base of the caudal: its last ray is very small, and its first one short and applied to the base of the second. The *caudal* is more forked than in the preceding species. The rays of all the fins are thick, particularly those of the anal.

INTESTINES.—Lining of the abdomen white. There is no distinction between the stomach and rest of the gut. The alimentary canal makes four convolutions between the gullet and anus, and bears a proportion to the total length of the fish, excluding the caudal, of 41 to 16. The lining of the intestine has the same minute longitudinal rugæ as that of the preceding two species. The *air-bladder* is divided into three portions, the central one being the largest, and communicating with the œsophagus. The upper one alone has a thick shining capsule.

## DIMENSIONS.

	Inches.		Inches.
Length from snout to tips of caudal . . . . .	19	Greatest depth of body . . . . .	12
"    caudal . . . . .	16	"    circumference . . . . .	5
"    anus . . . . .	12	Length of alimentary canal . . . . .	41

[55.] 4. CYPRINUS (CATASTOMUS) AUREOLUS. (Le Sueur.) *Gilt Sucking-Carp.*

*Catastomus aureolus.* LE SUEUR, *Journ. Ac. Sc. Phil.*, i, p. 95. An. 1817.

M. Le Sueur, who discovered this fish in Lake Erie, gives the following account of it, which we quote because no specimen came under our notice.

"*Anal fin* long, pointed, and passing considerably beyond the base of the *caudal*, which is forked with pointed lobes, the inferior lobe being the largest: *abdominal fin* truncated."——  
 "*Body* sub-cylindric, elevated at the nape; *head* quadrangular, gibbous above the eye, almost as high as long; the rays of the anal fin are very strong and large; *scales* rhomboidal, equal; body of a beautiful orange colour, which is deepest on the back, the base of the scales dark red; the sides are heightened with golden reflections; *pectoral*, *ventral*, and *anal fins* of a fine red orange, *caudal fin* of a deep carmine colour—the dorsal is paler than the rest of the fins; the *lateral line* is nearly straight, and commences on a level with the eye. *Length* of individual described sixteen inches: its depth three, and its thickness two inches and a half.

"FINS.—*P.* 18; *D.* 14; *V.* 9; *A.* 8; *C.* 18." (LE SUEUR, *l. c.*)

[56.] 5. CYPRINUS (CATASTOMUS) NIGRICANS. (Le Sueur.) *Black Sucking-Carp.*

*Catastomus nigricans.* LE SUEUR, *Journ. Ac. Sc. Phil.*, i, p. 103. An. 1817.

This species is, like the preceding one, an inhabitant of Lake Erie, where it is known to the fishermen by the names of "Shoemaker," and "Black Sucker." M. Le Sueur gives the following description of it.

"Head large, quadrangular; anal fin straight, its extremity reaching to the base of the caudal; eyes oblong; the lateral line straight, below the level of the eye."—"Body sub-quadrangular near the head; tail straight, short; caudal fin forked with pointed lobes; dorsal quadrangular and small; scales roundish; colour of the back blackish, of the sides and abdomen reddish-yellow, with dusky blotches; pectoral, abdominal, and anal fins reddish; caudal and dorsal dashed with black. Length of specimen thirteen inches.

"FINS.—P. 18; D. 11; V. 9; A. 8; C. 18." LE SUEUR, *l. c.*

[57.] 1. CYPRINUS (LEUCISCUS) GRACILIS. (Richardson.) *Saskatchewan Dace.*

FAMILY, Cyprinoides. GENUS, Cyprinus. Sub-genus, Leuciscus. CUVIER.  
No-natchees. CREE INDIANS.

PLATE 78.

The *Leucisci*, or *Daces*, have a short dorsal and anal, are destitute of spinous rays or barbels, and exhibit nothing peculiar in the structure of their lips. The species which we have figured abounds in that part of the Saskatchewan which flows through the prairie district, and is taken at Carlton-house in nets during the summer. It is but an indifferent article of food. Our specimen having been submitted to the inspection of Baron Cuvier, was returned with the following note attached to it: "*Espèce particulière de Cyprin voisin de notre Cyprinus microcephalus.*"

DESCRIPTION

Of a specimen taken in the Saskatchewan, April, 1827.

FORM.—*Profile* approaching to fusiform, most gibbous between the head and dorsal fin: belly flatter. *Head* small, crown broad and flat, muzzle rounded. The length of the head is contained five times in the total length from the snout to the tips of the central caudal rays. In the dried specimen lines or sutures can be observed on the top of the cranium, dividing it

into nine rectangular pieces. *Eyes* large and lateral: the orbits are two lengths of their axis from the end of the snout, and three lengths from the tip of the gill-cover; the space between them is flat. *Nostrils* close to the orbits. *Mouth* small, toothless: its upper margin, formed by the intermaxillaries, has a slight motion, shutting within the labials. The *labials* form, as it were, an outer lip, which is continuous with the rounded extremity of the snout that projects about a line beyond the orifice of the mouth. *Palate* and *vomer* smooth.

GILL-COVERS.—*Preoperculum* a narrow crescent, exhibiting in the dried specimen five or six pores on its surface, connected with an internal tube which pervades the whole bone. *Operculum* four-sided, larger than all the other bones of the gill-plates taken together: its anterior and under sides are the longest, and the latter overlaps the margin of the strap-shaped *suboperculum* its whole length. A membranous border edges the gill-plate and forms a flap at its apex.

SCALES large, thin, and, when dry, semitransparent. They vary little in size, and their length, which scarcely exceeds their breadth, is about eight lines. Their exterior edges are semicircular and uneven, but not regularly crenated, and their bases are cut almost transversely, but with a slight point in the middle. The surface of their uncovered segment is marked with ten or twelve fine streaks radiating from the centre. The *lateral line* is straight and contains fifty-five scales: there are seventeen scales in a vertical row under the dorsal, of which seven are above the lateral line. In the dried specimen there is a clear longitudinal streak along the centre of each row of scales, occasioned by the narrow space which intervenes between the adjoining rows becoming apparent from the transparency of the covering scale.

COLOUR pale oil-green on the back, fading to white on the belly. Sides of the head nacry.

FINS.—*Br.* 3; *D.* 9; *P.* 17; *V.* 8; *A.* 10; *C.* 19½.

The *dorsal* commences opposite to the attachment of the ventrals, and consists of nine rays, the first short and concealed by the skin; the second almost spinous, its articulations being only faintly visible at the tip; it is about half the length of the third, and is closely applied to it without the intervention of membrane. The articulations of the other rays are also obsolete towards their bases, but their summits are more or less branched. The *pectorals* have seventeen rays, the first one being much stronger than the others, and its articulations visible only at its summit. The *ventrals* are attached exactly midway between the gills and the anal fin: their rays have strong bony bases, with their upper halves distinctly articulated. The *anal* has ten rays, the two first being very short; they are all articulated, and the posterior ones are much branched. The *caudal* fin is forked and has nineteen rays, with four short basal ones above and five below. The depth of the fork equals the length of the central rays.

		DIMENSIONS.			
		Inches.	Lines.		
Length from tip of snout to the tips of the				Length of pectorals	Inches. Lines.
caudal		12	2	ventrals	1 6
" "	base of central caudal rays	10	4	attachment of anal	0 9½
" "	anus	7	0	longest rays of ditto	1 7
" "	dorsal or ventrals	4	10	lobes of caudal	2 4
" "	tip of gill-cover	2	3	central rays of ditto	0 11
" "	centre of orbit	0	11	extent of scales on the tail beyond	
" "	of attachment of dorsal	1	2	the bases of the caudal	0 6
" "	third or longest ray of ditto	1	10		
" "	last ray of ditto	0	7		

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[58.] 2. CYPRINUS (LEUCISCUS) CHRYSOLEUCAS. (Mitchill?) *New York Shiner.*

*New York Shiner (Cyprinus chrysoleucas), MITCHILL, New York Phil. Tr., p. 459?*

Mr. Todd, of Penetanguishene, sent me a short notice of a small fish which he considered to be the same with the New York Shiner. It is caught in the month of May, while spawning, on the shallows of Lake Huron, and is said to associate with the *Pomotis vulgaris* \*. It evidently belongs to the group of *Leucisci* which have the dorsal far back, but the descriptions given by Dr. Mitchill and Mr. Todd are not particular enough to enable us to infer, with any degree of certainty, that these gentlemen had the same species before them. They do not agree in their enumeration of the rays of the fins.

DESCRIPTION

By Mr. Todd of the largest individual which he saw.

“*Head* smooth, small, depressed on the upper aspect. *Mouth* small, even, toothless. *Eyes* large: irides yellow. *Body* deep, its depth being an inch and three-quarters in a fish six inches and a half long. *Lateral line* taking the curve of the belly. *Dorsal fin* far back. *Tail* forked. *Colour* of the back dark, of the sides golden-yellow.

“*FINS*.—*Br.* 3; *P.* 10; *V.* 9; *D.* 8; *A.* 12; *C.* 13. (Mr. Todd.)

3; *P.* 17; *V.* 9; *D.* 9; *A.* 14; *C.* 19.” (Dr. Mitchill.)

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Under the appellation of *EXOGLOSSUM NIGRESCENS*, or *Black Chub*, M. Rafinesque describes a Cyprinoid fish which inhabits Lake Champlain. His account of it is exceedingly brief, and his genus *Exoglossum*, founded chiefly on the *Cyprinus maxilingua* of Le Sueur, is not adopted in the *Règne Animal*.

“*Head* short, forehead smooth and convex; lower lip trilobated. *Body* oblong, blackish; *lateral line* nearly straight. *Pectoral fins* short, obovate; dorsal fin in the middle of the back; *tail* slightly forked.” (Rafinesque, *Journ. Ac. Sc. Phil.*, i., p. 417.)

\* Dr. Mitchill says that his *C. chrysoleucas* is found in the company of the *Percus flavescens* and *Pomotis vulgaris*.

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## ESOCIDÆ.

FISH of this family want the adipose fin, and the border of their upper jaw is either formed solely by the intermaxillaries, or if the labials enter at all into its composition, they are destitute of teeth. Their intestinal canal is short, without cæca, most of them have an air-bladder, and, with the exception of the *Microstoma* of the Mediterranean, all that are known have the dorsal and anal fins opposite to each other. The *Esocidæ* are voracious fish, many of them inhabitants of rivers. Most of the family is comprised in the Linnean genus *Esox*, which is subdivided in the *Règne Animal* into ten sub-genera, that differ from each other by many striking characters, such as the form of the body, which varies from a tolerably thick shape to a very slender one: the size of the scales, which may be moderately large, or quite imperceptible, or there may be a series of strong scales on the lateral line, or a row of keeled ones on each side of the belly: the mandibles also vary greatly in form, and somewhat in composition; thus both jaws may be moderately long and of equal length, or the upper one may be very short and the under one either simply projecting beyond it, or having its symphysis lengthened out into a half beak, or both jaws may be prolonged in the shape of a slender bill; the labials may form almost the half of the upper border of the mouth, or they may be altogether posterior to it, or even fixed to the cheek: there is an equal variety in the dentition, the teeth being, in some cases, small and confined to the margins of the jaws, in others long, card-like, and densely crowded on the mandibles, vomer, palate-bones, base of the tongue, branchial arches, and pharyngeal bones, or the pharyngeal teeth may be *en pavè*: the gill-covers have also very different forms in the different sub-genera, and in one case they are reduced to little membranous flaps: the gill-rays vary in number from three to eighteen or more. The *stomias barbatus* differs from the rest of the genus *Esox* in having a very long barbel on the lower jaw.

The following species, among others, belong to the seas or fresh waters of the United States. *Esox estor*, *reticulatus*, *niger*, *phaleratus*, and *lucius*, *Belone truncata*, *Scomber-esox scutellatus*, and perhaps *equirostrum*, *Exocætus exiliens*, *E. furcatus*, Mitch. (or *E. Nuttallii*, Le Sueur, *l. c.*, f. 1), and *E. comatus*, Mitch. (or *E. appendiculatus*, Wood, Journ. Ac. Sc. Phil., iv., p. 278). Several species of *Belone*, *Hemiramphus*, and *Exocætus* frequent the Caribbean Sea. The

sub-genera *Alocephalus*, *Microstoma*, *Stomias*, *Chauliodus*, and *Salanx*, contain one, or, at most, two species each, and belong to the Mediterranean, with the exception, perhaps, of *Salanx*, whose habitat is not mentioned in the *Règne Animal*.

[53.] 1. *ESOX LUCIUS*. (Linn.) *The Common Pike*.

FAMILY, *Esocids*. GENUS, *ESOX*. *Sub-genus*, *ESOX*, CUVIER.  
*ESOX LUCIUS*, AUCTORUM. RICHARDSON, *Fr. Journ.*, p. 716.  
*Eithinyoo-cannooshoo*. CREE INDIANS. *Gedd*, SCOTIS. *Gedde*, DANIS.

The true Pikes form the first division of the Linnean genus *Esox*. Their slender intermaxillaries, armed with small pointed teeth, occupy two-thirds of the border of the upper jaw: the labials which lie on the sides of the jaw are toothless. The vomer, palate-bones, tongue, pharyngeals, and branchial arches, are stuck full of teeth in card-like plates, and the sides of the lower jaw are armed with a row of long pointed ones. The snout is oblong, obtuse, broad, and depressed: the solitary dorsal is opposite to the anal. The stomach, wide and plaited, is continuous with a slender intestine, which is twice folded upon itself and has no cæca: the air-bladder is very large.

The Common Pike, a well-known inhabitant of the rivers and lakes of Europe and northern Asia, and even of the Caspian Sea, exists also in the United States of America, and in every piece of fresh water up to the arctic extremity of the continent; but it has not been found on the islands of the Polar Sea, nor is it mentioned by Fabricius as a native of Greenland. As it takes a bait set under the ice more readily than any other fish of the same districts, it forms an important resource to the Indian hunter in the depth of winter, when the chase fails him. In the summer it is occasionally shot while basking in shallow waters, but except in very urgent cases, powder and ball are of too high value in the fur countries to be thus expended. No quadruped, bird, or fish, that the pike can capture, seems to be secure from its voracity, and even the spiny perch is an acceptable prey to this water tyrant. The pike rarely weighs more than twelve pounds in the northern parts of America. Our specimen, taken in Lake Huron, was submitted to Cuvier's inspection, and it has also been carefully compared with English pike, without any specific differences having been detected.

## DESCRIPTION.

**COLOUR.**—*Back* tinged with blackish-green, which changes on the sides to light greenish-grey, and on the belly to pearl-white: on the tip of each scale there is a bright speck having the form of the letter v, and there are seven or eight longitudinal rows of oblong yellowish-grey spots on the sides of the head, body and tail. The cheeks yield brilliant emerald-green reflections; the under jaw and gill-membranes are white: the *irides* greyish-purple with a gold-yellow circle round the pupil. The *dorsal* and *caudal* fins are blackish-green, the former marked with four patchy, longitudinal bands of oil-green, and the latter striped between the rays with the same: the *anal* is pale greenish-grey with two or three horizontal bands of yellowish-grey, or buff-orange: *ventrals* the same, with brownish-orange tips; and *pectorals* mostly brownish-orange shaded with grey.

**SCALES** thin, broadly oval, their outer edge semicircular, their covered portion deeply divided by fissures into three or four lobes whose edges overlap\*. The cheeks and upper half of the operculum are scaly, the rest of the head is covered with smooth skin. The scales on the sides, which are somewhat larger than those on the back, measure three lines and a half in length by two and a half in breadth. There are 124 on the lateral line, and 36 in a vertical row before the ventrals: a linear inch, measured on the sides, contains seven scales. The *lateral line* is straight and rather nearer to the back than to the belly; it is formed by a deep notch in every third or fourth scale, and a groove in the subjacent one: there are several rows of these emarginated scales on the back and sides, resembling lateral lines.

**FORM.**—*Profile* oblong or lanceolate. *Body* four-sided, the back broader and flatter than the belly; the vertical diameter of the fore and middle parts of the body is about equal to one-seventh of its total length, caudal included: the transverse diameter is two-thirds of the vertical one, and the body carries its thickness to near the anal and dorsal fins, where it thins off into the compressed, tapering tail. *Head* forming one-fourth of the total length, caudal included. *Orbits* lateral, close to the crown and midway between the tip of the snout and the gill-openings. The space between the orbits is concave; the *snout* is broad, rounded, and depressed, and its tip is formed of a narrow cartilage covered by smooth membrane attached to the end of the vomer, and lying between the intermaxillaries. There are upwards of sixty pores on the head, disposed round the orbits, on the preopercula, occipital suture, and along the limbs of the lower jaw. The *mouth* is capacious. The *intermaxillaries* are very narrow, and are separated from each other by the somewhat dilated extremity of the vomer to which they are articulated: they are the only portion of the upper lip which is toothed. The *labials* have an oblong form, and are thrice the length of the intermaxillaries: their posterior piece is very moveable and projects a little beyond the anterior one. The *under jaw* is longer than the upper one by the thickness of the lip merely. The *palate-bones* are connected to the

\* In our English specimens there are only three lobes to the scales: in the Lake Huron one, most of the scales have four lobes, and their texture is more compact. These variations are, perhaps, to be attributed to a difference in the age of the fish. The Lake Huron specimen is larger, and may therefore be considered as older than the English ones with which we compared it.



vomer by membrane which allows a free hinge-like motion. The *tongue* is broad and truncated at the tip.

TEETH.—The *intermaxillaries* and forepart of the *lower jaw* are furnished with a single crowded row of small slightly-hooked teeth: on the sides of the lower jaw there is a row of rather remote, long, straight, very sharp, awl-shaped teeth, implanted into the bone, with some pretty large ones merely adhering to the gums. The palate bones and vomer are armed with card-like bands of teeth, the interior rows on the former, and anterior one on the latter, being longest: the teeth on the vomer become finer, and the band narrower, posteriorly, until it terminates in a point opposite to the angles of the mouth. The base of the *tongue*, the inferior and superior *pharyngeal bones*, and a *series of small plates* at the inferior union of the branchial arches, are rough like a file with minute teeth. The *branchial arches* are destitute of *rakers*, but a row of awl-shaped teeth, flanked on each side with nacreous stripes of teeth, like velvet-pile, crowns their acute edges.

GILL-COVERS.—*Preoperculum* narrow, slightly curved, and carrying its breadth to its extremities. *Operculum* quadrangular, four times the height of the *suboperculum*, which exceeds it a little in length. *Interoperculum* almost concealed beneath the edge of the preoperculum. The *gill-openings* are very large: the left membrane overlaps the right one at their insertion into the isthmus: the rays are cylindrical, the upper one alone being flattened\*.

FINS.—*Br.* 15; *D.* 20; *P.* 16; *V.* 10; *A.* 18; *C.* 18½. Lake Huron specimen.  
13; 22; 14; 10; 20; 18¼. English specimen.

The *dorsal* contains twenty rays, of which the first four are short and closely applied to the fifth: the fin is considerably rounded, and the length of its attachment is equal to its height. The *ventrals* are situated midway between the tip of the snout and extremities of the caudal. The *anal* is shaped like the dorsal, and equals it in the length of its rays, but has a shorter attachment: it is opposed to the twelve posterior rays of the dorsal. The *caudal* is sharply forked.

INTESTINES.—On opening the belly the *liver* presents itself, having an oblong form without lobes. The *duct* of the *gall-bladder* enters the intestine about an inch below the pylorus. The *stomach* is a straight tube, plicated internally and capable of great distention: its muscular coat is strong, and several longitudinal bands of fat and blood-vessels are continued from its peritoneal coat along the rest of the intestine. Below the *pylorus*, which is much contracted, the *intestine* gradually diminishes in calibre and in the strength of its coats: but the *rectum* is a little wider. A cordiform *spleen* is attached to the stomach. A large *air-bladder* extends the whole length of the abdomen: it has a tendinous capsule to which it adheres but slightly. The *kidneys*, of a wax-yellow colour, speckled with black, extend along the spine from the gullet to an inch beyond the anus: the urinary bladder is separated from the kidney by the lower end of the air-bladder.

\* One of our English specimens has 12 gill-rays, another has 13, and a third has 13 on one side and 14 on the other.

## DIMENSIONS

Of Lake Huron specimen, dried.

	Inches.	Lines.		Inches.	Lines.
Length from end of snout to tips of caudal	26	6	Length of pectorals	2	6
"    tips of central and caudal rays	25	6	"    ventrals	2	3
"    end of scales on caudal	23	8	"    attachment of dorsal	2	10
"    anus	18	0	"    central rays of ditto	2	8½
"    beginning of dorsal	17	6	"    attachment of anal	2	1
"    tip of gill-cover	6	3	"    central rays of ditto	2	7
"    orbit	2	9	"    lobes of caudal	3	11
of labials	2	5	"    central rays of ditto	1	8
intermaxillaries	0	9	"    lateral line	17	3
lower jaw	4	1	Extent of scales beyond base of caudal	1	0

Of recent specimen taken in the Saskatchewan.

Length from end of snout to tips of caudal	26	6	Length of œsophagus and stomach	8	0
"    base of ditto	22	6	"    from pylorus to rectum	15	0
"    anus	17	0	"    of rectum	2	6
of caudal fin	3	6	"    whole alimentary canal	25	6

[54.] 2. *ESOX ESTOR.* (Le Sueur.) *The Maskinongè.**Esox estor.* CUVIER, *Rég. An.*, ii., p. 282.

Our specimen of this pike was obtained at Penetanguishene, on Lake Huron, where it is rather scarce, being more common in Lake Erie and the southern Canadian waters. We did not meet with it in any of the rivers or lakes that discharge themselves into Hudson's Bay or the Polar Sea. Mr. Todd informed me that in the spring, which is its spawning season, it frequents the small rivers that fall into Lake Simcoe, and that it feeds on "small, gelatinous, green balls which grow on the sides of banks under water, and on small fishes." It attains the weight of twenty-eight pounds, and is considered as much preferable to the common pike for the table. It is a curious circumstance, that though the Maskinongè first received a distinct specific name from M. Le Sueur, his original description (*Journ. Ac. Sc. Phil.*, i. p. 413), quoted in the *Règne Animal*, applies exactly to the *E. lucius*, and not at all to *estor*. Our specimen of the latter was identified by Cuvier.

## DESCRIPTION

Of a Lake Huron specimen.

**COLOUR.**—It differs from the Common Pike, in the general tint of the body being lighter than the markings: the back is rather dark, the sides light bluish-grey, interspersed with roundish distinct or confluent spots about the size of buck-shot. When exposed to a strong

light, a quadrantal segment of each scale reflects bright colours, which change their place when the fish is moved, but there is no fixed pale angular mark on the tips of the scales, as in *E. lucius*. The scales are about half the size of those of the latter, and of a different form, their length and breadth being equal: and their middle lobe is the smallest; whereas in the Common Pike the middle lobe is rather the largest. The lateral line, measuring fifteen inches and a half, contains 162 scales, and there are about 45 in a vertical row before the ventrals: a linear inch on the sides contains a little more than ten scales. The structure of the gill-cover is nearly that of *E. lucius*, but the suboperculum is slightly broader and more rounded posteriorly, giving a curve to the edge of the plate, which is almost straight in *E. lucius*: there is also a distinctive mark in two rows of scales which descend on the anterior edge of the operculum in *E. estor*, until they reach the upper angular process of the suboperculum. The length of the head is contained four times and a half in the total length, including the caudal.

FINS.—Br. 18; D. 21; P. 12; A. 21; C. 19½.

The five anterior rays of the dorsal are short and applied closely to the base of the sixth. The four anterior rays of the anal are in like manner applied to the fifth.

DIMENSIONS

Of a dried specimen.

	Inches.	Lines.		Inches.	Lines.
Length from tip of snout to extrem. of caudal	23	3	Length of attachment of dorsal	2	5
" " central caudal rays	22	10	" central rays of ditto	2	7
" " anus	15	6	" attachment of anal	2	0
" " beginning of dorsal	14	6½	" central rays of ditto	2	7
" " tip of gill-cover	5	5	" lobes of caudal	4	0
" " orbit	2	4	" central rays of ditto	1	8
" of intermaxillaries	0	10½	Extent of scales beyond bases of caudal	0	11
" labials	2	1	Depth of caudal fork	1	4½
" lower jaw	3	6			
" ventrals	2	4½			

M. Le Sueur describes three other species of *Esox* which inhabit the fresh waters of the United States: viz., *reticulatus*, *niger*, and *phaleratus*; the first of which is known by its scaly opercula, and its flanks marked with brownish lines, which cross occasionally so as to form meshes.

[55.] 1. SCOMBER-ESOX SCUTELLATUS. (Le Sueur.) *Newfoundland*  
*Saury-Pike.*

GENUS, *ESOX*. LINN. Sub-genus, *Scomber-esox*. LACEP., CUV. (*Sairis*, Rafinesque.)

The *scombrèsoces* of Lacépède have a general resemblance to the *Belones*, garfish, or sea-needles, the same kind of long, slender bill, the upper border of which

is entirely formed by the intermaxillaries ; and also a row of keeled scales on each side of the belly, the scales which cover the rest of the body being scarcely apparent ; but they are like the mackerels in the posterior rays of the dorsal and anal, being distributed in detached finlets.

The *S. scutellatus*, described by Le Sueur, was taken from the stomach of a cod caught on the banks of Newfoundland ; and the *S. equirostrum* of the same naturalist is known only by a specimen in the Boston Museum. Nothing is said of their habits, but they are probably similar to those of the European species—the *Gowdnook*, or *Egypt-herring* of the Scottish fishermen, which enters the Firth of Forth in considerable shoals almost every autumn. “ It is,” says Mr. Neill, “ a stupid inactive fish, which is left on the shallows at the ebbing of the tide, with its long nose sticking in the mud, and is picked up in hundreds by the people from Kincardine, Alloa, and other places \*.”

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[56.] 2. The BRAZILIAN PIKE of Pennant is most probably a *Scomber-esox*. It resembles, it is true, a *Hemiramphus* in the great prolongation of the lower jaw ; but this sub-genus is characterised in the *Règne Animal* as having moderately large round scales, and no detached finlets behind the dorsal and anal: the known hemiramphi, moreover, inhabit the tropical seas, and it is, therefore, less likely that one should be found so far north on the Labrador coast as Croque Harbour, where Pennant's fish was taken. The following is that naturalist's account of it.

“ Pike with the under jaw very slender, and twice as long as the upper : the head smooth : body covered with *small* scales : the dorsal and anal fins opposite : between them and the tail a row of small spurious fins like the mackerel. Taken off Croque Harbour, and communicated to me by Sir Joseph Banks.” (*Arctic Zoology, Suppl.*, p. 145.)

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[57.] 1. EXOCETUS EXILIENS. (Bloch.) *North American Flying-fish.*

FAMILY, Esocids, CUVIER. GENUS, Exocetus, LINN.

The *Exoceti*, or Flying-fish, are readily known from all the other groups of the same order by the very great size of their pectoral fins, which spread out so as to

\* Wernerian Transactions, i., p. 542.

form a kind of wings capable of sustaining the fish during a short flight through the air. They have scales on the head and body, and a raised line of keeled scales along each flank, as in the gar-fish and saury-pikes; the head is flattened above and on the sides; the dorsal is over the anal; the upper lobe of the caudal is the shortest; the eyes are large; the intermaxillaries have no pedicles, and form the whole border of the upper jaw; the teeth are small and pointed on both jaws, and "*en pavés*" on the pharyngeals; there are ten gill-rays; the air-bladder is large, and the intestines straight without cæca. Some species have barbels on the lower jaw.

The Flying-fish inhabit all the warm and temperate districts of the ocean. Cuvier remarks that their wing-like pectoral fins serve as parachutes merely, but after daily observation of their flight, during a voyage of several months within the tropics, I can give my testimony to the correctness of Mr. Collie's statement, made in the Appendix to Captain Beechey's voyage, that these fish not only possess the power of descending and rising in the air without touching the water, but also of suddenly changing the direction of their flight, and going off even at a right angle previous to alighting in the sea. Their flight can extend to several hundred yards, and is very rapid, being apparently scarcely inferior to that of a swift bird: their descent into the water is sometimes sudden, as if they dropt down from exhaustion, at other times gradual like their ascent, and they occasionally bury themselves in the brow of a rising wave. They often rise from the water in a perfect calm, but they seem to take to the air more frequently during the prevalence of a moderate breeze, though this may be partly accounted for by our field of observation being increased when the ship was in motion. The approach of the vessel often occasioned the flight of a shoal of these fish, and we could then easily ascertain that the angle of the course with the wind varied, though I never saw them fly directly against a breeze, however slight. In the moonlight nights many flew into the ports of the small frigate in which I was then serving, and furnished a very agreeable addition to our breakfast.

The *exocetus exiliens*, which Bloch obtained from Carolina, is distinguished by the position of its long ventrals behind the middle of the body. It is figured by Dr. Mitchill (pl. v., f. 3) under the name of the New York Flying-fish, although he makes no mention of it in his text. The young have black bands on their fins, and M. Le Sueur's *E. fasciatus*, taken in the Gulf-stream, is, in Cuvier's opinion, merely one of these. It is probably this species which, keeping in the warm waters of the Gulf-stream, ranges northwards to the banks of Newfoundland. Cuvier observes, that the *E. exiliens* and *mesogaster* of Bloch resemble each other so much that it is not easy to distinguish the species by the descriptions and figures of voyagers.

Dr. Mitchill mentions the *mesogaster* as an inhabitant of the sea of New York; and Dr. Smith enumerates it among the fish of Massachusetts; but the notice of the former is too slight to prove that he has applied the name rightly, though sufficient to show that he is not speaking of the species which he has figured as the New York Flying-fish; and the latter writer gives no descriptions or figures in his work, whereby a naturalist may judge of the correctness of his determination of the species. The *E. volitans*, the most common species in the Atlantic, has small ventrals situated before the middle of the body. Both forms occur in the Pacific. Lieutenant-Colonel Smith makes the following remark on an *exocetus* which he observed off the Isle of Sable, near Nova Scotia. "I would have taken it for *mesogaster* or *exiliens*, but the wings, instead of being rounded beneath, were very unequally and acutely two-lobed, by a notch extending obliquely to near their lower margin; the eye was very large, the scales broad; the colour greenish-grey; and the length about ten inches.

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## SILUROIDEÆ.

THIS family is distinguished from the others of the same order by the skin being either naked, or protected by large bony plates, but always destitute of true scales. The intermaxillaries, suspended under the ethmoid bone, form the border of the upper jaw, while the labials are lengthened out into barbels, or are simply rudimentary. The intestinal canal is wide, without cæca, and doubles upon itself; the air-bladder is large, and adheres to a peculiar bony apparatus; the dorsal and pectorals have almost always a strong spine, with a joint for their first ray, and there is very often an adipose fin as in the Salmonoideæ. The family contains four genera, *Silurus*, *Malapterurus*, *Aspredo*, and *Loricaria*, the first of which, being by far the most extensive, is divided into twelve sub-genera. The species abound in the rivers of warm countries and are numerous in America. The following species have been detected in the United States. *Bagrus marinus*, *Pimelodus catus*, *albidus*, *nebulosus*, *æneus*, *cauda-furcata*, *nigricans*, *natalis*, and *insigne* (*livrée*, Le Sueur). *Doras costatus*, *Callichthys* (*Silurus callichthys*, Linn.) and *Aspredo* (*S. aspredo*, Linn.). The *Mysti*, *Hypostomes*, and *Loricariæ*, are South American fish. The *Schilbes*, *Synodontes*, *Heterobranchi*, and *Malapteruri*, are inhabitants of the Nile, Senegal, and some Asiatic rivers. The *Plotoses* are Indian fish. The *Silurus glanis* is the largest fresh-water fish that exists in Europe, being sometimes upwards of six feet long, and weighing three hundred weight.

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[58.] 1. SILURUS (PIMELODUS) CENOSUS. (Richardson.) *Huron*  
*Pimelode*.

FAMILY, Siluroideæ. GENUS, *Silurus*. L. *Sub-genus*, *Pimelodus*. LACRÉP., CUV.

Fish belonging to the genus *Silurus* have the mouth at the extremity of the snout; and in most of the sub-genera the first ray of the pectoral fins is a strong spine, articulated in such a manner to the shoulder-bone, that the fish can at pleasure lay it along the body, or fix it perpendicularly, so as to render it capable of inflicting a very dangerous wound. The head is depressed, the intermaxillaries

suspended to the ethmoid, and not protractile, the labials very small, but almost always prolonged into a fleshy barbel, besides which there are other barbels attached to the lower jaw, and even to the nostrils. The gill-covers want the subopercular bones; the strong, heart-shaped air-bladder adheres by its two upper lobes to a bony apparatus belonging to the first vertebra. The stomach is a fleshy *cul-de-sac*; and the gut is long and wide, without *cæca*.—Characters to distinguish the subgenera from each other may be found in the number and extent of the dorsal, or the presence or the absence of the adipose fins, the spinous or soft structure of the first dorsal ray, the form of the head, the number of barbels or their absence, the nakedness of the skin, or the presence of bony plates on the head, nape, lateral line, or whole of the sides, the dentition and the structure of the gills.

In the sub-genus *Pimelodus*, which is very rich in species, the body is destitute of lateral armature, being clothed merely with a smooth skin; the jaws, and frequently the palate-bones, are furnished with teeth like velvet pile, but there is no band of teeth on the vomer parallel to that on the upper jaw, as in the sub-genus *bagrus*. There is very great variety in the form of the head, and in the number of barbels appended to it. The *Pimelodus cænosus* inhabits Lake Huron, where it frequents muddy rivers and attains the weight of several pounds. It takes a bait readily and is excellent eating. A somewhat mutilated specimen, taken at Penetanguishene, and presented to me by Mr. Todd, having been sent to Baron Cuvier, was returned with the following remark: "*Pimelode très voisin du Silure noir de Lac Erie de La Sueur. Notre travail sur les Silures n'étant pas encore terminé nous n'avons pas fixé son nom.*" This pimelode belongs to the division or tribe of the sub-genus, in which there is only a single band of teeth on the upper jaw, and the head furnished with eight barbels, has an oval shape, without any bony plates appearing through the smooth skin.

## DESCRIPTION

Of a specimen from Penetanguishene.

FORM.—*Profile* oval, tapering into the tail. *Head* broadly oval, forming two-ninths of the total length. *Orbits* small and nearer to the snout than to the gill-opening. *Nostrils* situated some distance before the eye; a slender barbel, half an inch long, springs from their posterior margin. *Snout* obtuse. *Labials* ending in a tapering barbel, which is an inch and a quarter long and reaches to the gill-opening; there are also two slender barbels on each side of the chin. Both jaws are armed with a brush-like band of short *teeth*, very conspicuous in the dried specimen. The palate and vomer are smooth. The bones of the skull are firmly united together, and it is difficult to distinguish the pieces of the gill-covers through the skin. The upper gill-ray runs under the edge of the operculum, and is firmly joined to



it at one corner, thus supplying the place of the suboperculum, which is wanting in this genus: the *preoperculum*, though firmly connected to the operculum by bone, is marked out by its slightly-elevated edge, but the interoperculum cannot be traced through the skin. There are nine *gill-rays*, all cylindrical except the two superior ones, which are flattened at their upper extremities. The gill-openings are rather confined. The *humeral bones* are strong and spreading, with a process which can be felt through the skin, extending backwards above the pectoral; the nape is smooth.

FINS.—*Br.* 9; *D.* 1/7—0; *P.* 1/8; *V.* 8; *A.* 24; *C.* 17 $\frac{2}{3}$ .

The *dorsal* contains seven branched rays, the first of which is sheathed in the deep posterior groove of a strong acute pointed bone, that can be erected or depressed at the will of the fish. This bony spine is a little shorter than the first soft ray. The *adipose* fin corresponds to the hinder part of the anal. The *pectoral* is armed still more strongly than the dorsal, by a bone which is triangular at the base and compressed towards its acute tip: its posterior edge is serrated by ten or eleven acute teeth pointing downwards. The *ventrals* are posterior to the dorsal, and a little nearer to the caudal fin than to the end of the snout. The *anal* and *caudal* are large, and their outline, like that of the dorsal, is slightly rounded: the former has twenty-four rays, including three short anterior ones, and the caudal has many short basal ones, with seventeen long ones.

## DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from end of snout to tips of central caudal rays . . . . .	10	4	Length of adipose fin . . . . .	0	7
„ „ centre of orbit . . . . .	1	1	„ pectoral spine . . . . .	1	0
„ „ posterior angle of gill-cover . . . . .	2	4	„ rays of pectoral . . . . .	1	3
„ „ dorsal fin . . . . .	3	2 $\frac{1}{2}$	„ ventrals . . . . .	1	1
„ „ ventrals . . . . .	4	8	„ attachment of anal . . . . .	1	9
„ „ anal . . . . .	6	0	„ its central rays . . . . .	1	2
„ of attachment of dorsal . . . . .	0	9 $\frac{1}{2}$	„ lateral caudal rays . . . . .	1	8 $\frac{1}{2}$
„ central rays of ditto . . . . .	1	5	„ its central rays . . . . .	1	6
„ dorsal spine . . . . .	1	0			

[59.] 2. SILURUS (PIMELODUS) NIGRESCENS. (Le Sueur.) *Black Pimelode.*

*Pimelode noirâtre (P. nigrescens).* LE SUEUR, Mém. Mus. d'Hist. Nat. Paris, v. p. 153, Pl. 16. Lowest figure.

The *black pimelode* described, together with six other species, by M. Le Sueur, in the work quoted above, inhabits Lakes Erie and Ontario and their tributary rivers, frequenting places where the bottom is muddy. It is said to attain a great size, and is a sluggish, inactive fish, generally lying still for a long time in one

spot, so that it can be very readily captured by passing a noose over its head. It is also speared in the night time, by torch-light, which is a common mode of fishing in the lakes.

M. Le Sueur distinguishes this species by the orbicular shape of its head, the form of its body, which is broad anteriorly and compressed posteriorly, and by the black colour of its iris. It has eight *barbels* in the ordinary situations: the two pairs on the lower jaw are of equal length; the *eyes* are small; the anterior *nasal openings* are tubular, and, as usual, a barbel springs from the hinder margin of each of the posterior ones; the *cheeks* are rounded; the *snout* is broad and depressed; the *upper jaw* projects beyond the inferior one, and both are provided with fine, long, closely-crowded *teeth*, which are buried to their tips in the thick integuments: the gullet is also furnished with tubercles covered with teeth; the *dorsal*, broad and rounded, has its bony ray set posteriorly with teeth which point toward its base; the *anal* and *ventrals* are also rounded: the former is very long, the latter and the adipose fin are of medium size; the *caudal* is slightly crescentic at the end; all the rays of the fins, except the bony ones of the pectorals and dorsal, are divided and concealed by the very thick skin in which they are enveloped.

FINS.—*Br.* 8; *D.* 7; *P.* 10; *V.* 8; *A.* 25; *C.* 16. (LE SUEUR, *l. c.*)

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[60.] 3. SILURUS (PIMELODUS) BOREALIS. (Richardson.) *The Mathemeg.*

Cod mathemeg. PENN., *Arct. Zool. Suppl.*, p. 115. No. 94. *Intr.*, cxcii.  
 Silurus felis? RICH., *Frank. Journ.*, p. 723.  
 Le Chat. CANADIAN VOYAGEURS. Mathemeg. CREES.

The *mathemeg*, or *land cod* of the residents in the fur countries, is taken sparingly, during the summer months, in the lakes through which the Saskatchewan flows. It is the most northern American species of the family, but does not range higher than the 54th parallel. It is prized as a well-flavoured, rich fish, though its aspect is by no means prepossessing to one who is a stranger to its good qualities. Its Cree appellation signifies "ugly fish." A specimen which I brought home in 1821, is not now within my reach, but the species differs manifestly from the two preceding ones in the shape of its dorsal fin, and in its pectoral spine being void of serratures. The size of its head also requires it to be included in that tribe of the sub-genus which is indicated in the *Règne Animal* by the name of *Les Chats*, or *Cats*, in which the head is very broad, covered with naked skin, and fur-

nished sometimes with six, sometimes with eight barbels : there are no palatine teeth.

## DESCRIPTION

Of a specimen caught in Pine-Island Lake, lat. 54° N.

COLOUR dark greenish-brown on the back and sides : on the belly whitish.

FORM.—*Body* oblong, tapering posteriorly ; belly tumid before the ventrals. *No scales* : *lateral line* straight. *Head* flat and broad, its breadth equalling its length. There is a small lengthening of the cranium at the nape, which is concealed by the thick smooth skin. *Snout* obtuse, almost semicircular. *Mouth* at the extremity of the head, the upper lip slightly overlapping the lower one. There are eight *barbels*, two formed by the tapering labials and reaching to the gill-openings ; two springing from the upper borders of the nostrils, about an inch long ; and two pairs on the lower jaw, the outermost and longest measuring two inches and a half. *Teeth* small and erect in brush-like plates on both jaws : the palate and vomer smooth. *Dorsal* sub-quadrangular : its bony first ray smooth. The *pectoral* spine also free from denticulations. *Adipose fin* rather large and opposed to the posterior third of the anal. *Anal* large and long, terminating one-third of its own length from the base of the *caudal*. The latter has a wide shallow fork with obtusely-rounded lobes. The *length* of the specimen, excluding the caudal, was thirty inches.

FINS.—*D.* 1/6 ; *P.* 1/6 ; *V.* 9 ; *A.* 25 ; *C.* 17½.

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## SALMONOIDEÆ.

THE fish of this family were collected by Linnæus into a single great genus, which is concisely characterised by a scaly body; a first dorsal having articulated rays; and a second small one, not sustained by rays, but formed merely of a fold of the skin enclosing fat, and hence named the adipose fin. The *Salmonoideæ* have numerous cæca and an air-bladder; they almost all ascend rivers, their habits are voracious, and most of them are highly esteemed as articles of food. The surprising variety which exists in their dentition, and in the structure of their jaws, furnishes characters for the numerous sub-genera into which Cuvier has divided this extensive genus: but owing to the absence of obvious peculiarities by which we may distinguish one species from another of the same group in this family, and the difficulty of collecting specimens from various countries for comparison, inextricable confusion has crept into the synonymy. The loss which science has sustained in the death of Cuvier has deferred the rectification of this, which must be accomplished by some ichthyologist of adequate means and talents, before a precise statement can be made respecting the geographical distribution of the species.

In the TROUTS, or TRUE SALMON, constituting the first sub-genus (*Salmo*, Cuvier), the labials form a large portion of the border of the upper jaw, and there is a row of pointed teeth on these bones, the intermaxillaries, lower jaw, and palate-bones, and two rows on the vomer, tongue, and pharyngeals, so that the dentition is more complete than in any other tribe of fish. In the old males the point of the lower jaw is incurvated, and lodges in a cavity formed in the forepart of the roof of the mouth, anterior to a transverse membrane. The shape of the trouts is known to every one. Their ventrals are opposed to the middle of the dorsal, and the adipose is over the anal. They have about ten gill-rays. Their long, narrow stomach doubles upon itself, and the pyloric cæca are very numerous; the air-bladder reaches from one end of the abdomen to the other, and communicates with the upper part of the œsophagus. The trouts have almost always spotted bodies, and they are generally excellent food. They ascend rivers to spawn and surmount cascades, thus attaining the rivulets and small lakes of the highest mountains. Such is the compendious character of the sub-genus contained in the *Règne Animal*, to which we may add, that the group is an exceedingly natural one, so much so.

that very minute observation and much practical skill are requisite for the due discrimination of the species. No attempt that has hitherto been made to frame proper specific characters for the trouts has succeeded, and a great number of names have consequently been introduced into science which it is almost impossible to appropriate correctly. In some instances, several nominal species have been created, by the description of different states of the same trout under separate names, and as frequently two or more species have been confounded together. Most of the American trouts, though perfectly distinct, have been described as identical with the common European ones. The rectification of this confusion is a matter that concerns the legislator as well as the naturalist, for nothing certain can be learnt of the habits of a trout until we have the means of recognising it in its various stages of growth; nor without such knowledge can the legislative enactments which abound in North America, as well as in Europe, be of much utility, or indeed fail of being actually injurious. Figures, unless perfectly correct in all the details, do not aid us much in distinguishing species which are so similar in external form; and descriptions of colour, if unaccompanied by notices of peculiarities of structure, as is the case in many ichthyological works, are of still less service. The hues and markings of the trouts are modified by their age, food, and other circumstances. The younger individuals are generally more spotted than the older ones, which have a more uniform and often a deeper colour. When a trout has abundance of its proper aliment, as must be generally the case before it can attain a spawning condition, its scales acquire a splendour, and its markings an intensity and distinctness very different from what the same fish exhibits when out of season—so that we might say with M. Agassiz, these fish bedeck themselves, like birds, in a nuptial garb. This gentleman also observes, that the tints of the trouts are most brilliant, and their colours most vivid in the autumn, and at the time of the greatest cold, or in the months of October, November, December, and January; which is the precise period of the development of the spawn in many of the species. He likewise states that the most beautiful Salmon-trout are found in waters which abound in small *crustaceæ*, direct experiments having shown to his satisfaction that the intensity of the red colour of their flesh depends upon the quantity of *gammarinæ* which they had devoured. Dr. Knox's researches give a nearly similar result, by proving the red substance which is generally to be found in the intestines of a salmon that has recently quitted the sea to consist of the eggs of *echinodermata* and *crustaceæ*. To this rich aliment he attributes the brilliancy of the scales of a salmon in prime condition, and the high flavour and deep colour of its flesh.

Being convinced that much assistance in discriminating the different species of trout may be obtained by carefully observing the forms and relative sizes of the various parts of the head, particularly the opercular pieces, the heads of the American trouts, described in the following pages, are figured of the natural size, and two plates of the heads of British trouts are added for the purpose of comparison. The proportion of the head to the whole body, the dentition particularly of the vomer and tongue, and the form and size of the scales, have also been carefully noted in the descriptions. I have recently been led to conclude that the number of the pyloric cæca ought to be taken into account as a specific distinction; but living as I do in a part of the country where there are no trouting streams, and far distant from waters affording a variety of species, I have been unable to carry my anatomical researches to the extent that I could have wished; and I much regret that I did not turn my attention to this subject when I had it in my power to examine recent American specimens. I have been indebted, it is true, to kind friends for numerous presents of trouts from the Orkneys, Sutherlandshire, Kinrosshire, Dumfriesshire, and Wales; but such distant land-carriage was productive, in many cases, of so much injury to the specimens, that I could not always satisfactorily determine how far differences in the number of the cæca were connected with variations of external form.

The following species of trout are mentioned in the *Règne Animal* as existing in Europe. *Salmo salar*, *hamatus*, *Schiefermulleri*, *hucho*, *lemanus*, *trutta*, *fario*, *punctatus*, *marmoratus*, *savelinus*, *alpinus*, *salmulus* (samlet or par), and *umbla* \*. From the want of continental specimens for comparison, I am unable to say, with any pretension to correctness, how many of the British trouts can be arranged under

\* Nilsson enumerates as inhabitants of the waters of Scandinavia,—I. TRUTTE:—*Salmo solar*, *ocla*, *trutta*, *truttula*, *fario*, *punctatus*. II. SALVELINI:—*Salmo ventricosus*, *carbonarius*, *alpinus*, *pallidus*, *savelinus*, and *rutilus*. M. Agassiz, however, reduces the species on the continent of Europe to six, but admits that he has seen additional ones in Great Britain. His species are:—

- " 1. SALMO UMBLA, Linn., the Char of England, the *Ombre Chevalier* of the Lake of Geneva, the *Ratheli* of Swiss Germany, and the *Schwartz rental* of Salzburg.—Synonyms: *S. savelinus*, *alpinus*, Linn., *salmarius* (but not the *S. alpinus* of Bloch). This fish is found in England, Ireland, Sweden, Switzerland, and in all the southern parts of Germany.
- " 2. S. FARIO, Linn.—the Trout of brooks, Common trout, Gillaroo trout, and Par. Synonyms: *Salmo silvaticus*, Schrank, *alpinus*, Bloch, *punctatus* and *marmoratus*, Cuvier, and *erythrinus*, Linn. It is found as extensively as the first species.
- " 3. S. TRUTTA, Linn. Sea Trout—Salmon Trout. It is the same as the *Salmo lemanus* of Cuvier, and the *S. albus* of Rondeletius. It is found as extensively as the two preceding species.
- " 4. S. LACUSTRIS, Linn. The same as the *S. ilanica* and *Schiefermulleri* of Bloch. It is found in the lakes of Lower Austria, and in the Rhine above Constance.
- " 5. S. SALAR, Linn. The true Salmon. The *Salmo hamatus* of Cuvier is the old fish, and the *S. Gordeni* of Bloch is the young. Found in the northern seas, whence it ascends the rivers even as high as the Swiss lakes.
- " 6. S. HUCHO, Linn. Peculiar to the waters of the Danube." (Agassiz. Paper read before the British Association at the Edinburgh meeting, reported in Lit. Gaz.)

the preceding names : but to serve as an explanation of plates 91 and 92, and also as an introduction to the descriptions of the American trout, I shall give a few notices of the British ones that I have had an opportunity of examining. Of the correct designation of our most important trout,

1. *SALMO SALAR* there can be no doubt. The head of a "run fish," or of one taken on its way to the sea after spawning, is represented on Plate 91, f. 1. The posterior edge of the gill-cover is the segment of a circle, into the formation of which the suboperculum enters largely, and there is but one tooth on the vomer. The specimen was taken in the Water of Urr, a river of Galloway, in the month of December: some other particulars respecting it will be found in our account of the Quebec Salmon. Mr. Yarrell informs me that the Common Salmon has 60 vertebræ in the spine\*. The number of pyloric cæca appears to vary. The gentleman just mentioned having sent me the viscera of two large female salmon, brought to the London market, in prime condition, in the month of April, I found 63 cæca in the one, and 68 in the other. The gut and larger cæca of the former were filled with *botriocephali*, the roe was about one-third grown: the latter, which was not quite so far advanced towards the spawning state, was not infested with tape-worm: the alimentary canal of both was thickly lined with a tenacious mucus, mixed with some specks of a red matter resembling lobster spawn.

2. *SALMON-TROUT*. Under this name a fish is brought in large quantities to the London market in the beginning of summer. It has a very close resemblance to the Common salmon, of the same size, but has nevertheless an aspect so peculiar as to be readily recognised by the fishmongers. Its head is proportionably somewhat larger than that of the *salar*, but its vomerine teeth are nearly the same, that is, they vary in number from one or two to five or six, and are placed, in the latter case, two in front, the others in a single row, but turned alternately to opposite sides. The teeth generally are more slender and acute than those of the Common salmon. The gill-cover differs from that of the latter in the curve of its posterior edge being elliptical, in consequence of the suboperculum being much less rounded off. According to Mr. Yarrell, the Salmon-trout has only 59 vertebræ, or one fewer than the *S. salar*. One specimen from the Nith had 59 cæca, another 61. The head of the latter is represented in Plate 92, f. 1, A, with a view of its open mouth (f. 1, B), to show the dentition. The scales of the Salmon-trout are thin and delicate, and the spots on the sides have sometimes a slender crescentic form; at other times they assume the shape of two crescents turned back to back, or that of the letter *x*. I have obtained specimens from Loch Stennis, in the Orkneys, from the rivers Nith and Medway, and from Wales. In the latter quarter it is confounded with another species, under the name of Sewin. It feeds more upon fish than the Common salmon †. I took a young coal-fish and a fragment of sand-stone from the

\* Artedi says of the Common salmon of the Baltic (*Las Suecorum*), "*Vertebræ in universum quinquaginta sex.*"

† Lieutenant-Colonel Lawrence, an ardent and experienced angler, informs me that the salmon is more in the habit of springing out of the water than the Salmon-trout, and will do so either to take the artificial fly, or to disengage itself from the hook when it feels the smart; but the Salmon-trout, as soon as it is struck by the angler, descends directly to the bottom of the pool, and can scarcely be dislodged.

stomach of an Orkney specimen. Some British ichthyologists consider our Salmon-trout to be the *Salmo trutta*; but it is certainly not the species so designated on the continent, which has a prolonged double series of vomerine teeth. The brief remark in the *Règne Animal*, on the *Truite de mer*, or *Salmo Schieffermulleri*, applies in all points to our Salmon-trout.

3. The HIRLING of the Nith, and Whiting of the Esk, Phinoc, or *Salmo albus*, of Fleming, *Salmo Cumberland*, or *Le Saumon blanc*, of Lacépède, resembles the two preceding so much as to be readily mistaken for either. The head bears the same proportion to the body as in the Common salmon, and its scales are larger and still more delicate than those of the Salmon-trout, but the colours and markings are nearly the same. It is most readily distinguished by its vomerine teeth extending farther back in two rows, and being clustered in front. In several specimens the cæca were found to be 49. The intestines were lined with the same kind of grey mucus, mixed with spots of the red substance which is found in the guts of the salmon. This species enters the rivers in July and August, its flesh has a deep salmon colour and a very excellent flavour. The usual size is from one to two pounds. Larger individuals are confounded with young salmon, and are sold indiscriminately with them in the Dumfries market, under the name of "grilses." Salmon-trout are also frequently sold by the name of Hirlings.

4. Plate 91, f. 2, represents the head of a trout which is in Mr. Yarrell's possession. It was taken from a Glamorganshire fish, said to be the SEWIN (*Salmo Cambriscus* of Donovan), which is very probably the same species with the Bull-trout of the Tweed, and the *Salmo hamatus* of Cuvier. We have already remarked that the Salmon-trout is also called Sewin in Wales; indeed, the whole article in Pennant's British Zoology on the Grey evidently refers to the Salmon-trout\*. As I have not seen an authentic specimen of the *salmo hamatus* of the *Règne Animal*, I am unable decidedly to controvert M. Agassiz's opinion that it is merely a nominal species, founded upon a change of form which takes place in the old males of *Salmo salar*; but the evidence I have gleaned from authors induces me to follow Cuvier in considering it to be quite distinct. There can be no question that the two heads represented on our 91st plate belong to different species: now the lower one is very like the head of the Tweed trout, which, in the whole shape, as well as in the markings of the body, closely resembles Bloch's figure, t. 98, quoted by Cuvier as his *Salmo hamatus*. Were the peculiarities of the latter merely the effect of age, we should not find it more thickly and generally spotted than even the younger individuals of the Common salmon, which is in fact the case. The following passage, quoted from the Lachesis Lapponica, tends to prove, not only the northern range of the *Salmo hamatus*, but also that the hook of the lower jaw is developed even in young fish; but the old males of the Common salmon that we usually see in the Nith, and some other British rivers, have a comparatively slight hook. "Here," in Lulean Lapland, "the Common salmon is found with the under jaw occasionally hooked. I inquired whether this variety was esteemed a distinct species, or whether a difference arising from age: both of which questions I was

\* Pennant quotes doubtfully *Salmo eriox*, Linn., as synonymous with his Grey. It is described by authors as having a deeper body than the Common salmon, grey spots, and an even tail, characters which all occur in an old Salmon-trout. The caudal fin becomes even in several species of trout as they advance in age.



answered in the negative. I was shown a fish of the smallest size, which had in proportion as large a hook to the lower jaw as the largest. I inquired whether the hooked salmon were furnished with roe or milt. I was answered they had always milt. On opening seven of them I found this verified; whereas four salmon which were not hooked had roes. The hooked or male salmon is so called because the point of its lower jaw is bent inward and has a taper form resembling a finger, while, on the contrary, the upper one is formed with a cavity to receive the point, embracing it like a sheath for about half its length."

The Bull-trout of the Tweed is in little repute for the table; and Cuvier says that the flesh of the *Salmo hamatus*, though red, is not so rich as that of the Common salmon, and is held in less estimation. The Bull-trout of the Orkneys is also said to have the flesh hard and dry, and consequently to be little sought after by the country people; but as it had not entered Loch Stennis in the spring, at which time the other trouts of that lake were sent to me, I have not been able to procure a specimen, and am consequently ignorant how far it resembles the Tweed fish bearing the same name.

5. NITH TROUT, &c. Plate 92, f. 2, A and B, exhibits the head of a trout which was taken in the latter end of December in the river Nith. The entire specimen measured fourteen inches to the tips of the tail, or twelve inches and a half to the end of the scales on the base of the caudal fin. Figure 4, A and B, represents a young fish from the Clouden, a tributary of the Nith: it measured seven inches to the end of the scales on the caudal, and three-quarters of an inch more to the tips of that fin. I have received fine specimens of precisely the same kind of trout from Loch Crosspiel, below the manse of Durness, Loch Kescaig, which discharges its waters into the Atlantic near Sandwood in Sutherlandshire, and from Loch Stennis in the Orkneys. It is a handsome fish, not so deep in the body as the Salmon-trout, and assuming a different general aspect, from its much darker colours and its smaller scales. The colour of the back is a dark mixture of oil-green and brocoli-brown, the sides are greatly paler, and the belly is whitish with dusky shades. In some localities, or at certain seasons, the sides have a reddish-brown tinge, and the belly is more or less deeply glazed with orange. The forehead, snout, and gill-covers are crowded with rather large round or oval blackish-brown spots, and there are many roundish or stelliform marks on the back and sides, for some distance below the lateral line, some of which are surrounded by a paler circle, or tinged with aurora-red. The dorsal is variegated by several rows of smaller brown spots of different shades, and the adipose fin and upper lobe of the caudal are also spotted. The scales have an oval form, are considerably smaller, less flexible, and not so caducous as those of the Salmon-trout, and have a beautiful golden lustre. In the dried specimens an acute, prominent median ridge extends from the nape nearly to the tip of the snout, and the lateral ridges of the cranium are also conspicuous: in the fresh state, the head is smooth and rounded above, and the snout is very obtuse. The under jaw is exactly equal in length to the upper surface of the head. The vomerine teeth run back in a double row about half way to the gullet, and there are six teeth on each side of the tongue. The head in the females constitutes somewhat less than one-fourth of the total length excluding all the caudal beyond the scales: in the males the head is larger, four of its lengths extending from

the tip of the snout to the centre of the middle caudal rays. The dorsal vertebræ are 58 in number, and the pyloric cæca varied, in ten individuals, from 49 to 53. The young have paler colours, silvery scales, and about seven arterial blood-red spots on the lateral line, with pale areolæ. They descend to the sea and return into the rivers to spawn in the winter time. Individuals varying from sixteen to twenty inches in length contained mature roe. This trout is not very choice in its selection of food, the stomachs of those which I opened containing river shells, larvæ of insects, seeds of various vegetables, bits of straw and charcoal, much sand, small pebbles, the common coralline of our sea-shores broken down, and the roe apparently of its own species. The intestines of the young were filled with minute crustaceæ, flies, river-shells, and cod-bait, the last appearing to be a favourite food of the young of the salmon tribe.

Our Nith Trout possesses many of the characters ascribed to the *Salmo trutta* by continental ichthyologists \*, but in the absence of the power of referring to authentic specimens for comparison, I am unable to give it that appellation with confidence, especially as the descriptions and figures of *trutta*, by many authors, apply nearly as well to our Salmon-trout. The liberality and kindness of Captain Barou have furnished me with a beautiful stuffed specimen of the *Salmo Lemanus* of Cuvier, which is said by M. Agassiz to be merely a particular state of *Salmo trutta*. It has at first sight a very different aspect from our Nith trout, owing to its much paler general colour, smaller and more numerous spots, and somewhat larger scales; but on examining the details of external structure, the relative proportion of parts, and the dentition, they are found to be very similar to those of the Nith trout. The posterior angles of the gill-cover are, however, more rounded, giving a convex curve to its edge approaching to that of the Salmon-trout, and the length of the under jaw rather exceeds that of the top of the head. I have had no opportunity of examining the viscera of the Swiss trout.

6. LOCH LEVEN TROUT. I am indebted to Mr. Arnott for very fine specimens of this celebrated trout, which, in external form, the proportional size of the various parts of the head and gill-cover, the size of the scales, and the dentition, agrees with the *Salmo Lemanus*; the only difference that I can perceive, between the specimens that I have compared, being in the almost white hue of the one, and the deep shades of colour in the other. The scales in both dry in the same manner, producing a small ridge in the centre of each, which I do not perceive in other trouts. Three individuals of the Loch Leven trout, that were dissected, had each 73 pyloric cæca, and in one of them 59 vertebræ were counted. The largest of the specimens measured twenty inches and a quarter including the caudal fin, and two inches less to the end of the scales. Its colours were as follows. The back liver-brown, nape hair-brown, top of the head wood-brown, sides of the head and body silvery tinged with rose-red, under jaw, throat, and belly whitish, partially glazed, particularly near the ventrals, with Dutch-orange. The top and sides of the head are marked with round blackish-brown spots, which are largest on the gill-covers, where they equal swan-shot in size. The whole side of the fish, from the ridge of the back to half way between the ventrals and lateral line, is ornamented with

\* Nilsson's character of the *Laxförling* of the Swedes, which is his *Salmo trutta*, applies exactly to our Nith Trout.

many larger spots of venous blood-red margined with crimson. These spots are roundish, stelliform, or cruciform\*. There are nine or ten rows of small brown spots on the dorsal, and some on the adipose fin and upper lobe of the caudal. The ridges on the top of the head, visible in the dried specimen, resemble those of the Nith trout in form, but they are more acutely prominent, particularly the lateral ones. The scales are broadly oval. The stomach contained the larvæ of insects, the remains of a fish, much sand, a bit of charcoal, and two or three fragments of sand-stone.

7. *SALMO FEROX*. Sir William Jardine and Mr. Selby have recently given this name to a northern Scottish trout, of which a specimen has been kindly transmitted to me by Mr. Selby, the well-known ornithologist. It resembles the Loch Leven trout in its dentition and the proportional size of the head; there is also a resemblance, though not a perfect one, in the form of the gill-cover; but the labials are much stronger and more curved, and the cranial ridges much less prominent and acute. The most decided difference is in the form of the scales, which in *Salmo ferox* are broadly oval, more nearly approaching to circular than in any of the preceding species; they are as thin and flexible as those of the Salmon or Salmon-trout, though being more thickly covered with epidermis they are not so caducous. In colour, this fish is described as resembling the Loch Leven trout, but the spots in the specimens we have seen are fewer and larger. The caudal fin is even at the end, as in the old individuals of many other species of trout. The *Salmo ferox* inhabits Loch Awe, in Argyleshire, where it attains the weight of twenty-eight pounds. It spawns on the sides or near the gorge of the lake, rarely entering the feeding streams; and although it is occasionally taken in the river Awe, by which the lake discharges itself into the sea, it is said that it never attempts to reach the salt water. Its stomach is generally filled with fish. The colour of its flesh is orange-yellow, its flavour coarse and indifferent. There is a good account of this great trout in the last edition of the Encyclopædia Britannica, under the article *Angling*.

8. *SALMO FARIO*. The Common trout, the Burn trout of Scotland, is generally known throughout Great Britain. It varies very greatly in the hue of its body and the colour and brilliancy of its markings. Plate 92, f. 3, A and B, represents the head of an individual nine inches and a half long to the end of the scales on the caudal, and ten inches and three quarters to the extremity of that fin. The under jaw is shorter than the top of the head, and the ridges of the palate bones and vomer, into which the teeth are implanted, are much more prominent than in any other species that has come under my observation. The vomerine teeth run far back in a double row. The specimen was taken in the Lake of Lochenbreck, in Galloway, and had the dusky yellowish hue of this trout when it inhabits dark waters. A much more glittering kind is taken in the Nith, Tweed, and other clear rivers, but I have not the means of ascertaining whether there be any structural difference or not. Mr. Yarrell informs me that the *Salmo fario* has 58 dorsal vertebræ.

9. *CHAR. Torgoch*, or Red-bellied trout. Plate 92, f. 5, A and B, exhibits the head of a female char taken in Llyn Cawellyn, near the foot of Snowdon, on the 17th of January,

\* The spots of my specimen of the *Salmo Lemanus* are considerably smaller than those of Loch Leven trout, but the case might be different were a greater number of individuals compared.

when ready to spawn. The scales of this trout are small, the colours peculiar, and there is merely a tuft of fine teeth on the forepart of the vomer, the rest of that bone being perfectly smooth. I owe the specimen to the kindness of J. L. Wynn, Esq., of Coëd Coch, in Denbighshire. The *Tarrogan* from Loch Borley, in Sutherlandshire, has a deeper body and larger scales than the Welsh Torgoch, but the want of good specimens has prevented me from instituting a fair comparison between the two. They agree in dentition, and differ from the preceding trouts in the scales being less crowded, and in many parts of the body not tiled but simply in contact.

The want of a sufficient number of specimens of the Par, and of some other Scottish trouts, causes me to pass them over without further notice\*.

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[61.] 1. SALMO SALAR. (Auctorum.) *The Common salmon.*

FAMILY, Salmones (Salmonoides), CUVIER. (Salmonacei, NILSSON.)

Salmon abound in the rivers of Labrador, Canada, Newfoundland †, Nova Scotia, the New England States, and in the waters of New York which fall into the St. Lawrence. Previous to the colonization of America, they appear to have ranged more to the south on the Atlantic coast than they do at present. The celebrated but unfortunate Hudson says, that on the 14th of September, 1609, while sailing up the magnificent river which bears his name, he saw "great store of salmons;" but in recent times even a solitary salmon has rarely been known to stray thither, and the most southern stream on that coast which this fish now frequents, is Connecticut river, in latitude  $41\frac{1}{4}^{\circ}$  N ‡. Even there, however, it is becoming daily more scarce, the erection of weirs, milldams, and other obstacles to its ascent in the spawning season, having impeded its reproduction, and the New York market is now supplied with salmon from Kennebec river in the state of Maine. The salmon ascends the St. Lawrence and its tributaries as high as Lake

\* Sir William Jardine has published an interesting paper on the Sutherlandshire trouts in the *New Edinburgh Philosophical Journal*, which I did not see until the preceding observations on the Salmonoides had mostly gone to the press. He gives the following as the most convenient distinguishing marks of the Par, or *Salmo salmulus*, Ray:—"The great size of the pectoral fins, the shortness of the maxillary bone, and consequent diminutive gape, and the breadth between the rami of the lower jaw." In Pennant's *British Zoology* (8vo. ed., 1812), the figure in pl. 70, judging from the configurations of the markings and general habit, is that of a young salmon, while the lower figure, in pl. 87, is the true Par.

† The earliest account we have of Cabot's discovery of this island in 1497 (recorded on Adams's map) mentions salmon among its natural productions. Hakluyt, iii., p. 6.

‡ "White salmons," noticed by Smith in his account of Virginia, and by subsequent writers, as abounding in the creeks of Pennsylvania, are evidently the *Labre salmoide* of Lacépède, or *Grytes salmoide* of Cuvier, a percoid fish, which we have already alluded to in p. 31. It is called "trout" by the inhabitants of Carolina and the neighbouring states.

Ontario, its progress farther up being effectually barred by the falls of Niagara. It has been noticed as a remarkable fact in the history of the fish, that it has never been known to enter the Niagara, or even to have been taken within thirty miles of its mouth, though there is nothing to hinder it from ascending to the foot of the falls, about fifteen miles from the lake. De Witt Clinton has, however, accounted for this fact in remarking the want of gravel beds in the Niagara, fitted to be depositaries of the salmon-spawn. Salmon are found in Lake Ontario at all seasons, and they have been caught in the Seneca, or Onondaga river, which falls into the south side of the lake in every month of the year, sometimes weighing thirty-seven pounds. "They pass," says De Witt Clinton, "Oswego at the entrance of this river in April, are then in fine order, and spread over all the western waters in that direction, returning to Lake Ontario in October, much reduced in size and fatness." "Numerous conical erections of gravel, found in several of the western rivers, must have been raised by them." Another account states, that these fish make their appearance in Lake Oneida, which communicates with the Onondaga, in May, and that they eat nothing during their residence there, which continues till winter\*. Mr. Todd informed me, that they enter the shallow, gravelly rivers in the vicinity of Toronto, on the north side of Lake Ontario, in August, are taken in great abundance in September, and continue to ascend until November. Their average weight is about eight pounds, and their length two feet and a half. They are taken in nets or speared by torch-light. Some years ago, a considerable fishery was established at the head of the lake, and great quantities of fish were cured for exportation, but the establishment was broken up by the war. No salmon have been seen in the Mississippi or its tributaries.

Salmon enter the rivers that fall into Hudson's Bay north of the 58th degree of latitude. According to Hearne, they are very numerous, in some seasons, in Knapp's Bay and Whale Cove, so that a vessel might speedily be loaded with them, but they are very scarce in other years. They are, he says, sometimes so plentiful in Churchill river, that upwards of two hundred fine fish have been taken in one tide, from four small gill-nets set within a mile of the fort; but at other times they are so rare that twenty nets have scarcely yielded the same number during the season, which begins in the latter end of June, and closes about the middle or end of August. The commencement of the season coincides with the breaking up of the ice †. The weight of the fish varies from eight to twenty pounds.

\* Lit. and Phil. Trans. of New York, i, p. 147 and p. 500.

† The following dates were extracted from a Journal kept by Mr. Topping at Churchill factory, five or six miles above the mouth of the river:—

Having seen only dried specimens of the Salmon of the Atlantic coasts of America, I cannot unequivocally refer it to the *Salmo salar* of European ichthyologists, though popular writers affirm them to be the same. The identity of the Hudson's Bay salmon rests on more uncertain grounds, as I am not aware that it has been examined by any naturalist. I have for many years used every endeavour to procure a specimen in vain. An argument may even be adduced against the specific identity of the Hudson's Bay salmon with the *salar*, from the fact of its being unknown farther south in the bay than the Churchill river, in latitude  $58^{\circ} 47' N.$ , though Nelson, Hayes, Albany, and Moose rivers, lying between the 50th and 57th parallels, abound in the gravel-beds which salmon delight to spawn in. Dried salmon are among the articles of traffic brought to ships by the Esquimaux of Hudson's Straits, and the *Salmo salar* is mentioned in the *Fauna Grælandica*, though Fabricius states it to be so rare that he never saw it there, and had merely heard of its existence in two bays. It was not taken on any of the late expeditions to the arctic coasts of America or the Northern Georgian islands. It is said to frequent the Kamtschatdale rivers, and though in much smaller numbers than any of the many other anadromous trouts that are known there, it may, perhaps, range to the American side of the sea of Kamtschatka. Every voyager who has visited the north-west coast speaks of the great quantities of salmon taken by the natives; and Langsdorff mentions that "several sorts" of salmon resort to the bays and rivers of Oonalashka, Kodiak, and Norfolk Sound. Eschscholtz, however, who stayed from March to the middle of August in one year, and during the latter part of August and beginning of September in another, on the island of Sitchka, in Norfolk Sound, observes that "there is no great variety in the kinds of fish, but the individuals are numerous, especially a well-flavoured sort of salmon." We shall have occasion hereafter to quote some of Lewis and Clark's notices of the trouts of the Columbia. The accounts given by authors of the habits of the American salmon are so very meagre, that it is necessary to borrow what we have to say of the natural history of the *Salmo salar* from the ichthyologists who have best described it as it exists in European waters.

Few fish have attracted more attention than the Common salmon of the Old

1809.	June 17.	River broke up.
1810.	19.	River clear. July 3. Caught the first salmon.
1811.	23.	River clear. July 31. Plenty of Sea-trout. August 12. Sea-trout gone.
1812.	10.	River beginning to open. July 5. River clear.
1813.	20.	River clear. June 30. First salmon caught.

It is to be observed, that the ice accumulates at the mouth of the river for some days after it has broken up opposite to the fort.

World, its excellence as an article of diet, and the variety of interests involved in the fisheries established for its capture, rendering a correct knowledge of its natural history an object of much importance in an economical point of view. A well-authenticated and connected account of its growth, from the newly-evolved fry to the full-sized fish, is, however, still a desideratum, for, although many facts have been established by competent observers, there are several gaps in the history of this trout, and in particular the form it assumes when half grown has not been fully discriminated from the young of other species. It is greatly to be regretted that our acquaintance with the Salmon of the American rivers is so very limited, for should it happen that the *Salmo hamatus* and *trutta*, or other closely-resembling species, are unknown in America, we might more readily ascertain how many of the forms known in Great Britain by the local names of *smelts*, *smolts*, or *smouts*, *grawls*, *gilses*, *grilses*, *salmon-peel*, *kippers*, *liggers*, &c., actually belong to the *salar*. The natural history of the Salmon, prosecuted in a country where conflicting interests have not as yet sprung up to cause the perversion of facts, would furnish a rich field of research for ichthyologists, and afford the means of clearing up many mistakes which have crept into the works of naturalists,—great care being, of course, taken to ascertain the correct specific appellations of the subject under observation.

The Common salmon is an inhabitant of all the northern European and Asiatic seas, from the entrance of the Bay of Biscay round the North Cape, and along the coast of Asia to Kamtschatka and the sea of Ochotsk, including the Baltic, White Sea, Gulf of Kara, and other inlets. It is found in Iceland, and, according to Guldenstædt, it also inhabits the Caspian. At certain seasons the Salmon quits the sea, and ascends the rivers towards their sources for the purpose of spawning, preferring those streams which have stony or rocky bottoms, and convenient gravelly banks for the reception of the spawn. Nilsson, however, informs us, that in some instances the Salmon resides permanently in fresh water, for it is known, says he, to winter in the interior Swedish lakes, named Wenern and Siljan, from whence it ascends the rivers at the close of spring, without entering the salt water at all\*.

As the Salmon is never taken on the British coast except in estuaries, rivers, or lakes, the depths of the sea to which it retires are unknown †; but the microscop-

\* In interioribus quibusdam lacubus, *Wenern*, *Siljan* hiemem degit, undè vere preterlapso fluvios ascendit. Lacubus igitur ut mari, pro hibernis utitur, aquam salsam nunquam attingens. Vernæ horum lacuum dicuntur pinguiore et carne saturatiores, quam marini, qui, itinere et impedimentos fatigati, dictos lacus inturdem attingunt. NILSSON, *Pisces Scand.*

† The following extract from Leems's Journey into Danish Lapland may throw some light on the matter. "At the

pical researches of Dr. Knox have shown, as we have already mentioned, that its food, previous to its quitting the salt water, consists of the eggs of various *echinodermata* and *crustaceæ*, this rich aliment giving the colour and flavour for which its flesh is so highly prized. On entering the fresh water for the purpose of spawning, it seems, like many other animals in the nuptial season, to lose its appetite for food, but will rise occasionally to the natural or artificial fly, and has been known to take both the minnow and worm\*. Salmon in prime condition are taken in estuaries at every period of the year, but they do not quit the sea in considerable numbers until the summer is well advanced, and they continue in the tide-way, ascending with the flood and descending with the ebb, until the spawning season approaches. At first the fish has a bright silvery hue, with deep black spots on the back and sides, a head small when compared with the girth of the plump body loaded with juices and fat, the spawn occupies but little space, the salmon-louse (*Caligus piscinus*) adheres to the gills, and tape-worms fill the intestines. As the reproductive organs advance to maturity, the salmon hastens up the river towards the gravelly deposits in the upland streams, which are its proper spawning places, surmounting the natural and artificial barriers that oppose themselves to its progress with surprising agility. Pennant mentions the perpendicular falls of Kennerth and Pont Aberglasslyn, in Wales, Leixlip, in Ireland, and East-eivel on the Tummil, in Scotland, as salmon-leaps, which evince the extraordinary muscular efforts that the fish is capable of making; and travellers have recorded with admiration its perseverance in working its way up the cataracts of the Norwegian and Lapland rivers. Soon after its entrance into the fresh water, the dark spots on

close of the autumn, when the salmon taken in the rivers are lean and no longer saleable, the maritime Laplanders are accustomed to row out a little from the shore into the deep, to take the salmon (who at this time of the year remain immoveable at the bottom of the sea), with an iron-headed spear, called in Lapland *Harses*. Lest the darkness of the night should obstruct them in this business, a fire is made on the prow of the vessel of pieces of fir-tree and the bark of the birch, which they call *baral*." (Pinkerton's *Voy.*, i., p. 427.) The salmon while feeding upon the ova of *echinodermata* will, no doubt, remain almost stationary; but if they continue in a moderate depth of water, so as to be attracted by the light of a torch, or easily speared, one would expect them to be occasionally taken in the trawl-nets in such constant use in the British Channel.

\* Mr. Niell relates that salmon kept along with other sea-fish in a salt-water pond in Galloway, were fed with eels, shell-fish freed from the shell, and herrings cut into pieces. The habits of fish in captivity do not furnish correct indications of the food they would prefer when at liberty; but the following passage in Sir William Jardine's paper tends to prove, that salmon do not feed exclusively on *crustaceæ*, *entomostraca*, or the ova of *echinodermata*, during their residence in the ocean, though it is certain that it is the remains of these substances which are chiefly distinguishable among the mucus which thickly lines the intestines of salmon when they ascend rivers in spawning condition. "In the north of Sutherland a mode of fishing salmon is sometimes successfully practised in the firths, where sand-eels are used for bait: a line is attached to a buoy or bladder, and allowed to float with the tide up the narrow estuaries. The salmon are also said to be occasionally taken at the lines set for haddocks, baited with sand-eels. At the mouths of rivers they rise freely at the artificial fly within fifty yards of the sea, and the common earth-worm is a deadly bait for the clean salmon." The following additional remark occurs in a note: "Faber, in his *Natural History of the Fishes of Iceland*, remarks, that the Common salmon feeds on small fishes, and various small marine animals—Fleming says its favourite food in the sea is the sand-eel." (JARDINE, l. c.)



the back and sides are effaced, the salmon-louse shrivels and drops off, and the tape-worms die and are discharged. As the spawn augments in volume, the flesh of the salmon deteriorates, growing lean, flabby and insipid, and the bright silvery tints of the scales are replaced by brownish stains, giving rise to the epithet of "red-fish," in contradistinction to that of "clean," which the fish had on its first arrival from sea in high marketable condition. The gravelly shoals selected as spawning places are generally as high up the river as the fish can ascend. Furrows about eighteen inches deep being formed in the gravel by the male, according to some observers, or by both male and female as others report, the latter deposits in them her roe, and the former his milt, and carefully covers them up. The fish has been said to plough up the gravel with its fins, but it is more probable that it uses the nose for this purpose. Mr. Potts (quoted by Pennant) thinks that the tail is the instrument by which the gravel is filled in over the spawn, as he had observed the skin rubbed off that part; this abrasion, however, may be the result of friction against stones, in the efforts the fish makes to ascend the shallow streams. After securing the spawn, the salmon commences its return to the sea, being now named, in the language of the fishermen, a "foul fish," ligger, kipper, or kelt; its gills are infested by the *gisler*, or *brachiella salmonia*, and it continues to have a dark colour, lank form, and to be unfit for food during the remainder of its stay in fresh water. The period of a salmon's stay in a river is determined by various causes. The ascent of most streams is facilitated by the land-floods of wet seasons, or rendered impracticable for a time by droughts; and Dr. Fleming thinks it probable that circumstances which favour the upward passage of the fish tend also to accelerate the ripening of the spawn\*. In returning to the sea the fish keep the middle of the stream, and seek the deepest and saltest water of the estuary.

The following observations on the spawning of the salmon, and subsequent evolution of the young fry, in one of the tributary streams of the Tweed, are recorded by Dr. Knox in the paper we have already cited. "In November the river Whitadder, which has its source in a mountainous country nine hundred feet above the level of the sea, abounded in all the different kinds of salmon usually taken in the Tweed, with which this stream communicates at a short distance from Berwick. They were engaged every where in spawning, this being the usual time in which the act is carried on. A pair, seemingly † of the ordinary Tweed

\* Ed. Phil. Journ., x., p. 375, in a paper which gives a detailed account of the movements of the Salmon in the river Tay. The facts therein stated coincide generally with Mr. Potts's history of the Tweed salmon in Pennant's British Zoology.

† The Tweed Bull-trout, or *Salmo hamatus*, might be readily mistaken for the *Salmo solar*.

salmon, from fourteen to sixteen pounds in weight, were watched. The ova were observed to be deposited near the sources of the stream on the 2nd of November, and covered up with gravel in the usual way. The spawning bed was placed at the foot of a pretty long and placid pool, and just at the top of a stream where the water first begins to feel the effects of the approaching descent. The water was about fifteen feet broad, with a depth of six inches. The breadth of the bed seemed to be about eight feet, and its length three or four, the whole having rather an oval form. It had the appearance of washed gravel, in consequence of the whole mass having been turned over by the salmon during the process of depositing the ova. On the 25th of February, or one hundred and sixteen days afterwards, hundreds of ova were turned up with the spade from the depth of from nine to twelve inches below the surface of the gravel. They were clear, transparent, and seemingly unchanged. On the 23rd of March the ova were found to be changing; the outer shell cast; the fry lying imbedded in the gravel as fishes, being *twenty weeks* from the period of their deposition. By the 1st of April most of the fry had quitted the bed, by ascending through the gravel, and on the 19th of that month many were taken eight or even nine inches long, in excellent condition. Fry of the same size, but probably of a later deposit, were abundant in the same streams on the 5th of May. In a former year the roe was found unchanged on the 10th of April, but on the 17th the excluded fry were imbedded in the gravel, and on the 22nd smoults were taken about the size of the little finger. The depth at which the ova are deposited varies, being sometimes about two feet below the surface of the bed. The food of the fry is exactly the same with that of the trout found in the rivers at the same period; viz., small insects, larvæ of flies, beetles, and cod-bait, with which the gravel of the stream abounds in an incredible degree. In the gravel-bed the ova of salmon and trout lie safe from every living enemy, and in the midst of profusion of food, whose habitat is the same as their own; and whose progress of incubation and subsequent rise through the gravel is quite similar. The great variety and quantity of these insects, together with the depth of their situation (for the spade which took up the ova was also full of them), was truly surprising. It is probable that as these larvæ of insects, for such they mostly are, rise above the gravel to assume new forms, they offer ready food for the trout and salmon fry of all sizes which may be in the river; but I do not suppose that these fishes dig under the gravel in search of food at any time\*.

\* No trout affords the young angler more certain amusement than the salmon fry. These unsuspecting *smoults* have keen appetites and rise with avidity at the artificial fly, however rudely made, provided it be small enough—but a caddis worm, or a gentle impaled on a hackle, is a still more alluring bait. We have known a bare-legged truant kill thirty dozen in one day with the most inartificial tackle.

“The growth of the fry is very rapid. On the 20th of April the rivers were full of salmon-smoults, varying from six to nine inches, having attained that length in about three weeks. They were in the finest possible condition, covered with small silvery scales, differing in shape from those of the trout or par. They are very tender, and constantly die a short time after being touched. During the months of March, April, and May, the rivers abound with kelts, or spawned salmon, descending towards the ocean, and smoults, or fry, pursuing the same course.” Dr. Knox, in the appendix to the able paper from which the foregoing passages are abridged, remarks that there are two circumstances which persons of sound judgment and great experience with regard to the salmon question still think undecided, or at least demanding a more extended proof. The *first* is a series of experiments to determine the growth of salmon-fry from the state of the egg to its attaining the length of six, seven, eight, or nine inches, before which it is seldom seen by the angler, and after which it ceases to be found in fresh-water rivers; *secondly*, proof that the fish we call salmon-fry, taken in salmon-rivers by angling during the months of April and May, do really proceed to the ocean and return after a period to the rivers as *grilse*, *Salmon-trout*\*, and salmon. The facts ascertained by Dr. Knox, in conjunction with the previous observations of others who have attended to the subject, go towards the answer of the *first* question; and the following extract from Sir William Jardine’s paper may be considered as a reply to the *second*. “It has always been a subject of dispute whether the fry returned to the rivers as *grilse* in the same season in which they descended. I have had no doubt of this for several years, but it was very difficult to prove. In the Tweed I have killed *grilse* early in the season, so small as to weigh only two pounds, and seen them gradually increase in size as the season advanced; the intermediate size, however, between the fry and the two pound *grilse* was wanting. During the two years which the fisheries of Sutherland have been in the possession of the Duke, a set of experiments have been instituted by his factors, one of which leaves no doubt upon the subject. Last spring, several thousands of the fry were marked in the different rivers, among others by Mr. Baigrie, in the Laxford and Dinard, on the west coast. In the Laxford, the first *grilse* (marked in April as fry) returned on the 25th of June, and weighed three pounds and a half. Many others were got during the season, from this weight to six pounds and a half, returning to the rivers where the fry were marked, which was known by a particular mark being used in each, and showing that a return to their breeding ground was as frequent, or rather

\* Dr. Knox considers our *Salmon-trout* to be merely a variety of the *Salmo salar*.

as constant, as among the higher animals. These marked grilse were unfortunately killed; but next year it is proposed to return them to the river with an additional mark, and endeavour to take them again a second season."

The spawning season commences in most of the British streams in October, is at its height in November, and continues through December, comparatively few salmon spawning in January, February, or March. It is necessary that the different kinds or species of salmon should be more fully made out before we can refer to the history of the Common salmon the statements to be found in authors of the great differences in the spawning seasons in different rivers\*.

The salmon has many enemies, of whom man is undoubtedly the chief, for its numbers diminish rapidly as civilization and the arts advance on the banks of the rivers it frequents. Notwithstanding the proverbial † activity of this fish, it is hard pushed in its own element by several of the mammalia. Captain Cartwright saw a bear taking salmon in the mouth of one of the Labrador rivers by diving in deep water ‡; the otter too, a well-known river poacher, makes great havock among the salmon of all ages; and the seal has been observed, on the coast of Scotland, coursing a salmon like a greyhound in chase of a hare, turning it on every attempt it made to get to seaward, and finally securing it through the exertion of superior strength and sagacity. The following anecdote is told by the Rev. Mr. Hamilton, of a dog leaguering with man against this fish. "In riding from Port

\* Dr. Arthur Young informs us, that "in all the rivers which run into the Ban, the salmon spawn about the beginning of August, and as soon as they have done swim to the sea, where they stay till January, when they begin to return to fresh water, and continue doing so till August, in which voyage they are taken. The nets are set in the beginning of January, but by Act of Parliament no nets or weirs can be kept down after the 12th of August. The young salmon are called *grawls*, and grow at a rate which I should suppose scarce any fish commonly known equals; for within the year some of them will come to sixteen and eighteen pounds, but in general ten or twelve pounds: such as escape the first year's fishery are salmon; and at two years old will generally weigh twenty to twenty-five pounds. This year's fishery (1776) has proved the greatest that ever was known, yielding four hundred tons of fish; and they had the largest haul, taking one thousand four hundred and fifty-two salmon at one drag of a single net."—(Tour in Ireland.)

Linnaeus states that the salmon-fishery of the Laxholms, or Salmon islands, in Lulea Lapland, commences "a fortnight before Midsummer (June 10th) and ends on St. Bartholomew's day, August 24, and that during that space of time the salmon keep ascending the river. After that day none of the fishermen remain. Few of the fish escape being taken, so as to return down the river. At Michaelmas (29th of September) the fishermen come here again, when they catch a smaller sort of salmon." (*Lachesis Lapponica*, ii., p. 118.)

Leems relates that in the river Alten, which has its rise in the remotest mountains of Lapland, the fishery begins on the festival of St. John (June 24th), at which time the salmon are very fat, and so large that a tun can scarcely hold sixteen, but those which enter the river as the autumn is approaching, are of a much smaller size and also lean. In the Thana, the principal river of Eastern Finmark, the season lasts from the beginning of spring until two weeks after the festival of St. John the Baptist (July 8th). The fish in this river are peculiar for their breadth and fatness, and are accounted the very best of their kind. (LEEMS, Journey into Danish Lapland. An. 1767.) Sir William Jardine, in speaking of the spawning time, remarks that "The northern rivers, with little exception, are the earliest, a fact well known in the London markets." "It is a mistaken notion to suppose that the spawning season is only between October and February. In many rivers it would commence in the end of August, if the grounds and entrance to the rivers were left open and unmolested." JARDINE, *l. c.*

† "Dicitur namque salmo a saltu." OLAVUS MAGNUS, *Hist. Sept.*, p. 523.

‡ G. CARTWRIGHT, *Sixteen Years' Residence in Labrador*.

Rush to the Giant's Causeway with some company, we had occasion to ford the river Bush, near the sea; and as the fishermen were going to haul their net, we stopped to see their success: as soon as their dog perceived the men to move, he instantly ran down the river of his own accord, and took post in the middle of it, on some shallows where he could easily run or swim, and in this position he placed himself with all the eagerness and attention so strongly observable in a pointer dog who sets his game:—we were for some time at a loss to comprehend his scheme, but the event satisfied us, and amply justified the prudence of the animal; for the fish, when they feel the net, always endeavour to make directly out to sea. Accordingly, one of the salmon, escaping from the net, rushed down the stream with great velocity towards the ford, where the dog stood to receive them at an advantage. A very diverting chase now commenced, in which, from the shallowness of the water, we could discern the whole track of the fish, with all its rapid turnings and windings. After a smart pursuit, the dog found himself left considerably behind, in consequence of the water deepening, by which he had been reduced to the necessity of swimming. But instead of following this desperate game any longer, he gave it over, and ran with all his speed directly down the river till he was sure of being again seaward of the salmon, where he took post as before in his pointer's attitude. Here the fish a second time met him, and a fresh pursuit ensued, in which, after various attempts, the salmon at last made its way out to sea, notwithstanding all the ingenious and vigorous exertions of its pursuer. Though the dog did not succeed at this time, yet I was informed that it was no unusual thing for him to run down his game; and the fishermen assured me that he was a very great advantage to them in turning the fish towards the net. During the whole of the chase, this sagacious animal seemed plainly to have two objects in view; one to seize his game, if possible, and the other to drive it towards the net when the former failed; each of which he managed with a degree of address and ingenuity extremely interesting and amazing\*."

I have been able to procure only four specimens of the American salmon. The first one, described below, was taken from a tierce of salted fish, which a fishmonger assured me was imported from Quebec. The colours of the skin were remarkably well preserved by the salt, and the specimen, which had been split along the back with a sharp knife, was easily restored to its original form. It had then a very perfect resemblance to a British salmon of the same size. Three other specimens were prepared for me at the instance of James Keith, Esq., of La Chine,

\* Rev. W. Hamilton, *Hist. of the Basaltic on the Coast of Antrim, &c.* 1784. (PINK. Coll., iii., p. 877.)

by a gentleman in charge of the fur-posts on the Mingan and Musquaw rivers, which fall into the St. Lawrence near its mouth. Were it not that the skins of these appear to have been overstretched in drying, so as to account, at least in some degree, for the differences of the relative positions of the fins, I should have considered them as distinct from the *Salmo salar*, and I still think that their identity with that species is somewhat doubtful.

## DESCRIPTION

Of a specimen preserved in salt, imported from Quebec.

COLOUR.—*Head* bluish-grey above, very silvery on the sides; two round black spots about the size of a pea between the eye and the nape, and one upon the operculum. *Back* and upper parts of the *sides* pearl-grey with a strong silvery lustre, reflecting a purplish tint when opposed to the light: the lower parts of the sides have an uniform pearly tint with much lustre. There are four rows of black spots above the lateral line, each spot surrounding one scale, and running into the interstices of the adjacent ones: some of the rows cease towards the head and tail; they contain about thirty spots on each side. The *under jaw*, *throat*, and *belly* are unspotted white. The *pectorals* and *caudal* are white at the base, their tips and the whole of the dorsal being bluish-grey: the *anal* and back of the *ventrals* are grey with whitish rays.

SCALES thin, flexible, and nacre; the uncovered portion of each on the back and upper part of the sides is rhomboidal. Near the dorsal fin there are seven scales in a linear inch, but adjoining to the lateral line there are only six. On the lower parts of the sides the margins of the scales are segments of circles. A scale taken from the lateral line is oval, obtuse at both ends, and about one-third longer than it is wide. There are 124 scales on the lateral line, including the small ones on the base of the caudal, and 47 in a vertical row below the dorsal, of which 20 are above the lateral line, and the same number between it and the ventrals.

FORM.—*Head* small and neat, forming one-fifth of the total length excluding the caudal: it is convexly conical when the jaws are closed, the profile of the forehead being a continuation of the moderate curve from the dorsal. Tip of the *snout* rounded but not broad. *Orbits* circular, placed one diameter from the upper end of the labials, two from the tip of the snout, and three and a half from the posterior edge of the gill-cover. The *nostrils* are as near again to the orbit as to the end of the snout. The *intermaxillaries* are cartilaginous and are one half the length of the labials. The *labials* are thin and flat with a slightly curved anterior edge: they are narrow at their junction with the intermaxillaries, but spread out into elliptical plates towards the angles of the mouth: the posterior piece, or apophysis, which is acutely elliptical, forms more than half the breadth of the labial, but does not reach quite to the tip of the latter. The distance between the tip of the snout and extremity of the labial reaches a little beyond the base of the snout\*, or a line drawn from the posterior edge of one orbit to that of the other. The under jaw is acute and projects slightly beyond the snout

\* *Linea rostri banalis* of Nilsson.

when the mouth is open, but its tip is received within the intermaxillary teeth when the jaws are closed. The lower jaw is about two lines shorter than the distance between the tip of the snout and the nape.

**TEETH** conical, acute, mostly pointing backwards, and placed in a single row on the under jaw, edges of the palate-bones, and round the entire margin of the upper jaw, except about half an inch of the lower extremity of the labials: those on the sides of the snout and towards the tip of the lower jaw are a little longer than the others. There are two teeth on the anterior part of the vomer, one before the other, and five on the tongue, two on one side and three on the other. (In the head of the Scottish salmon, figured on plate 91, there is but one tooth on the vomer and four on the tongue.) Neither the vomer or palate-bones rise into ridges where the teeth are implanted, either in the American or European salmon, and there are no small teeth on the tip of the tongue.

**GILL-COVERS.**—The free edge of the gill-cover is semicircular, instead of being elliptical or angled as in many species of trout. *Preoperculum* broad, being but little narrower in its middle than the cheek, and more than half the width of the operculum: its posterior edge is even, but there are five irregular, diverging, tubular prominences on the surface of its lower limb. *Operculum* about one-fourth higher than broad, and marked on its posterior and inferior borders with fine furrows. *Suboperculum* about one-third of the height of the operculum, but equalling it in width. *Interoperculum* irregularly triangular, with a long narrow limb passing forwards beneath the preoperculum to the articulation of the lower jaw. *Gill-rays* twelve on the left side and eleven on the right.

**FINS.**—*Dorsal* containing thirteen rays, the first one being very short and with the second closely applied to the third, which nearly equals the fourth and longest. The *ventrals* are opposite to the ninth and three following rays of the dorsal. The *anal* contains ten rays, the first one being very short. The *adipose* fin is partly opposite and partly posterior to the termination of the anal. The *caudal* is forked.

A specimen of the MINGAN RIVER SALMON, prepared for me by Mr. Cumming, corresponds closely with the above description, except in the following particulars. Part of the *snout* before the orbit proportionally longer. *Vomer* perfectly toothless—*Ventrals* rather more posterior, being opposite to the three last rays of the dorsal. The *adipose* fin is also farther back, being wholly behind the anal. The *caudal* is almost even at the end when extended, being very slightly crescentic. The specimen has lost most of its colours in drying, so that its markings cannot be compared with the Quebec fish.

The kindness of the same gentleman has also furnished me with two specimens of the MUSQUAW RIVER SALMON.—The largest has quite lost its colours and has been overstretched in stuffing, so that the dimensions of its body cannot be quoted with safety, but in the relative dimensions of the parts of its head it resembles the Quebec fish more closely than the preceding\*. It has two teeth on the vomer, one before the other, and two on each side of the

\* On comparing the dimensions of the larger Musquaw River salmon with that of a prime Scottish one of the same length in the subjoined table, the head of the former appears altogether smaller, but, as we have remarked above, the skin may have been overstretched, and the total length consequently disproportionately increased.

tongue. The smaller specimen is in perfect preservation, except that its colours are faded. The four rows of black spots are, however, distinct enough. There are four teeth on the vomer, the two anterior ones being abreast. It does not seem that in this specimen the relative position of the fins could have been in any way altered, yet the ventrals correspond to the three last rays of the dorsal, and are even partly posterior to that fin. In other respects there is no material difference between it and the Quebec fish, and a close comparison with a small Scottish salmon, or *grilse* of nearly the same size, showed an almost perfect similarity in the scales and external form.

In the following table of dimensions I have given exact measurements not only of the American specimen but also of several British salmon with which I compared them.

FINS.—*Br.* 11—12; *P.* 13; *D.* 13—0; *V.* 9; *A.* 10; *C.* 20 $\frac{1}{2}$ . Quebec salmon.

11—12; 13; 14—0; 9; 11; 19 $\frac{1}{2}$ . Mingan R. ditto.

11—11; 14; 15—0; 9; 12; 19 $\frac{1}{2}$ . Musquaw R. ditto.

10—12; 14; 14—0; 9; 12; 19 $\frac{1}{2}$ . Ditto, ditto.

DIMENSIONS.

	No. 1.		No. 2.		No. 3.		No. 4.		No. 5.		No. 6.		No. 7.		No. 8.	
	Quebec Salmon.	Mingan River Salmon.	Musquaw River Salmon.	Musquaw River Salmon.	Scottish Spawned Salmon, River Nith. Decem.	Prime Salmon, same River. August.	Grilse, River Nith. August.	Young Salmon, London Market, Wt. lbs. March.								
Length from tip of snout to extremities of caudal . . .	26 3	29 1	36 0	23 9 $\frac{1}{2}$	38 9	36 9 $\frac{1}{2}$	24 0	15 6								
"    "    end of central caudal rays . . .	25 2	28 9 $\frac{1}{2}$	35 8	22 10 $\frac{1}{2}$	37 8	35 5	23 4	14 5								
"    "    end of scales on caudal . . .	23 9	26 10 $\frac{1}{2}$	33 6	21 8 $\frac{1}{2}$	35 5	33 4 $\frac{1}{2}$	22 0	13 7								
"    "    end of base of adipose fin . . .	19 9	22 5	27 8	17 7 $\frac{1}{2}$	29 4	28 3	17 8	11 1								
"    "    end of attachment of anal anus . . .	19 2	21 10	27 1	17 2	29 1	27 2	17 9	10 11								
"    "    first ray of ventrals . . .	17 2	18 10	24 6	15 2 $\frac{1}{2}$	26 1	24 1	16 4	9 7								
"    "    end of dorsal . . .	11 9 $\frac{1}{2}$	13 8	17 4	11 1	18 10	17 10	12 2	6 9								
"    "    commencement of dorsal . . .	13 4	14 3	17 4	10 9	19 7	18 5 $\frac{1}{2}$	12 0	7 2								
"    "    posterior edge of gill-cover . . .	10 11	11 7	13 9	8 6	15 11	15 1 $\frac{1}{2}$	9 2	5 9								
"    "    nape . . .	4 7 $\frac{1}{2}$	5 2	5 3	4 2	6 10	6 2	4 6	2 8								
"    "    posterior edge of orbital bones . . .	2 10 $\frac{1}{2}$	3 2 $\frac{1}{2}$	3 3 $\frac{1}{2}$	2 6 $\frac{1}{2}$	4 4	4 4	2 10	1 8 $\frac{1}{2}$								
"    "    base of snout (hind. part of orbit) . . .	3 0	3 2 $\frac{1}{2}$	3 3 $\frac{1}{2}$	2 8	4 3 $\frac{1}{2}$	4 1	3 0	0 0								
"    "    centre of orbit . . .	2 2	2 4 $\frac{1}{2}$	2 5	2 1	3 4	2 11	2 2	1 2								
"    "    tips of labials . . .	1 10	2 1	2 2	1 8	2 11	2 6	1 10	1 0								
"    "    of intermaxillary . . .	2 2 $\frac{1}{2}$	2 4 $\frac{1}{2}$	2 6 $\frac{1}{2}$	2 0 $\frac{1}{2}$	3 6	3 0	2 2 $\frac{1}{2}$	0 0								
"    labial . . .	0 9 $\frac{1}{2}$	0 10 $\frac{1}{2}$	0 10	0 8	1 3 $\frac{1}{2}$	1 1	0 9 $\frac{1}{2}$	0 4 $\frac{1}{2}$								
"    lower jaw . . .	1 6 $\frac{1}{2}$	1 8 $\frac{1}{2}$	1 9 $\frac{1}{2}$	1 3 $\frac{1}{2}$	2 7	2 3	2 7	1 0 $\frac{1}{2}$								
"    pectoral rays . . .	2 7 $\frac{1}{2}$	2 10	3 1 $\frac{1}{2}$	2 3	4 2	3 7	2 7 $\frac{1}{2}$	1 7 $\frac{1}{2}$								
"    ventrals . . .	2 9 $\frac{1}{2}$	3 2	3 1	2 7	4 0	3 8 $\frac{1}{2}$	2 8 $\frac{1}{2}$	1 10								
"    ventral appendage . . .	2 4	2 9 $\frac{1}{2}$	2 7	1 9	3 3 $\frac{1}{2}$	2 11	3 2	1 5								
"    attachment of dorsal . . .	1 0	1 2 $\frac{1}{2}$	1 4	0 9	1 3 $\frac{1}{2}$	1 6	0 11	0 0								
"    longest rays of ditto . . .	2 5	2 9 $\frac{1}{2}$	3 7 $\frac{1}{2}$	2 3 $\frac{1}{2}$	3 8	3 4 $\frac{1}{2}$	2 5	0 0								
"    last ray of ditto . . .	2 6	2 10	3 0	2 2	3 6 $\frac{1}{2}$	3 1	2 6	1 8								
"    attachment of adipose . . .	0 11	1 2	1 3	1 0	1 4	1 5	1 0	0 7								
"    height of adipose . . .	0 9	0 7	0 8	0 6	0 8 $\frac{1}{2}$	1 2	0 8 $\frac{1}{2}$	0 5								
"    attachment of anal . . .	1 2	1 2	1 0	0 9	1 9 $\frac{1}{2}$	1 8 $\frac{1}{2}$	0 9	0 7								
"    longest ray of ditto . . .	1 8 $\frac{1}{2}$	2 2	2 4	1 7 $\frac{1}{2}$	2 10	2 6	1 3 $\frac{1}{2}$	1 1								
"    space between anal and caudal . . .	2 2 $\frac{1}{2}$	2 8	2 6	1 9 $\frac{1}{2}$	3 5	2 10	1 10	1 5								
"    lobes of caudal . . .	3 0	4 0	5 0	3 8 $\frac{1}{2}$	4 10	4 6	3 1 $\frac{1}{2}$	0 0								
"    central rays of ditto from end of scales . . .	4 3	4 5	5 0	3 4	5 10	5 5	4 2	0 0								
Depth of caudal fork . . .	1 5	0 11	1 10	1 3	2 6	2 0 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 5								
	1 3	0 7 $\frac{1}{2}$	0 4	0 11	0 11	1 1	1 2 $\frac{1}{2}$	0 7								

Obs. The dimensions of the intestines of two English salmon are given in a subsequent page, at the end of our account of the *True trout*.



[62.] 2. SALMO SCOULERI. (Richardson.) *Observatory Inlet Salmon.*

FAMILY, Salmonoides. GENUS, Salmo. CUVIER. Sub-genus, Salmo. ID.

## PLATE 93.

Fig. A, entire fish, one-third nat. size. B, head, and C, roof of the mouth, nat. size.

I am indebted to Dr. Scouler, of the Dublin Institution, for a specimen of this very interesting salmon, which he obtained when on the north-west coast of America, in the service of the Hudson's Bay Company. It was taken in the month of August in Observatory Inlet, and Dr. Scouler remarks that "this arm of the sea was frequented at the time by such myriads of the salmon, that a stone could not have reached the bottom without touching several individuals, their abundance surpassing the efforts of imagination to conceive. The little brook that empties itself into the inlet was swarming with the fish ascending to spawn, and in the course of about two hours we killed sixty with boarding pikes. The hump before the dorsal fin consists of fat, and appears to be peculiar to the males, who acquire it after the spawning season, when their snouts become elongated and arched." Having directed Dr. Scouler's attention to Pennant's notices of the Kamtschatka salmon, he favoured me with the following second communication. "I will endeavour to answer your questions seriatim. I think the Observatory Inlet salmon comes nearest to the *gorbuscha*\* of Kamtschatka. According to the best of my remembrance, the colour of the belly is white, inclining to yellow, and the back is of a bluish leaden colour. Nothing can be more different than the appearance of the two sexes in the spawning season. The female is round and beautiful, with the jaws of equal length; while the male is compressed laterally and has a long arched snout with powerful teeth. The flesh of this salmon is red, and we thought it excellent, quite equal to that of the English salmon,—no one on board objected to it." "The natives of the Columbia use two modes of cooking salmon. One consists of *steaming*, which is accomplished as follows: A number of heated pebbles are thrown into a

\* "The *gorbuscha*, or hunch-back, ascends the rivers in July. In form it resembles the Grayling: never exceeds a foot and a half in length: is of a silvery colour, and unspotted: the tail forked; the flesh white. After it has been some time in fresh water it changes its shape (the male especially) in a most surprising manner. The jaws and teeth grow prodigiously long, especially the upper, which is at first shortest, but soon shoots beyond the under, and grows crooked downwards: the body becomes emaciated and the meat bad: but what is most characteristic, an enormous bunch rises just before the first dorsal fin, to which it owes its name. Its flesh is bad, so that this fish falls to the share of the dogs. Rays. D. 14—0; P. 15; V. 11; A. 18." (PENN., *Arct. Zool. Intr.*, p. CXXV.)

wooden trough, and some bits of wood or small branches placed over them; the pieces of fish are then put in, a little water added, and the whole covered with mats until the fish is cooked. The second mode is broiling the salmon. The intestines are taken out, and two or three bits of wood inserted into the body of the fish to keep it expanded transversely; a stronger stick is passed through the tail and head, and its lower end stuck into the ground at a convenient distance from the fire. The salmon is to the north-west Indians what the *cerealìa* are to us, the fishing season being their harvest. During the summer the natives reside near the coast, or on the banks of rivers in which the salmon are abundant, and occupy themselves in curing the fish for winter use. They cut two long and broad slices from each side of the fish, dry it in the shade, and eat them like bread. Vast quantities are thus prepared, and though no salt is used it forms a palatable food, which I have often eaten. Sometimes the dried fish is broken down, kept in bags, and eaten by handfuls, when it may be called the *pemmican* of the north-west coast. After the salmon season the Indians retire inland with their abundant store.

“Pennant says the Kamtschatka salmon die without returning to the sea, after spawning. I never heard such an opinion mooted on the north-west coast, and saw nothing to confirm it; but as the streams which the American salmon ascend are often extremely shallow, and as they spawn in Observatory Inlet during the months of July and August, when the water is at the lowest, I should suppose that great numbers must perish from emaciation (for their flesh then becomes white, or at least a great deal less red and of bad quality), and from the extreme difficulty they must experience in returning to the sea from the want of water, and perhaps from its high temperature. Thousands must also be devoured by the osprey, the white-headed eagle, and the otter, in the fresh waters, and by the seals in the sea, so that I should think few survive. I am unable, however, to say whether any return to the sea or not; or whether the large teeth drop and the incurvated snout returns to its former dimensions. The females want the large teeth, and so do the males before spawning, at least I saw none with large teeth in the Columbia in April or May. We left that river in June, and did not return until September.” (Scouler, *in lit.*)

The following extract from Sir Alexander Mackenzie's Journey to the Pacific, describes the mode in which the salmon roe is prepared for food by the natives of New Caledonia. “He took the roes out of a bag, and having bruised them between two stones, put them in water to soak. His wife then took a handful of dry grass in her hand, with which she squeezed them through her fingers; in the

meantime her husband was employed in gathering wood to make a fire, for the purpose of heating stones. When she had finished her operation she filled a *watape*\* kettle nearly full of water and poured the roes into it. When the stones were sufficiently heated, some of them were put into the kettle, and others were thrown in from time to time till the water was in a state of boiling. The woman also continued stirring the contents of the kettle till they were brought into a state of consistency; the stones were then taken out, and the whole seasoned with about a pint of rancid oil. The smell of this curious dish was sufficient to sicken me without tasting it, but the hunger of my people surmounted the nauseous meal. When unmixed with oil the roes are not unpalatable."

We have no means of ascertaining whether the Observatory Inlet salmon be one of the several kinds seen by Langsdorff at the island of Kodiak and on the adjacent coast, nor whether Dr. Scouler's conjecture, that it is the same species which abounds in the Columbia be correct; but Lewis and Clark's account of the salmon they observed in that river is subjoined to the following description of *Salmo Scouleri*.

## DESCRIPTION

Of a specimen taken in Observatory Inlet by Dr. Scouler, 1825.

FORM.—The *profile* is much arched between the nape and the dorsal fin, and the body there is thick but gradually tapers to the caudal. *Head* convex, transversely between the eyes, but in profile descending nearly in a straight line from the nape to the nostrils. *Orbit* ovate, situated more than thrice its length from the posterior edge of the gill-cover. The *posterior orbital bones* reach backwards to the upper angle of the preoperculum. The *nostrils* open about half an inch anterior to the orbit. The *jaws* are very long, and, in our specimen, the intermaxillaries are greatly prolonged and incurvated, projecting beyond the lower jaw: they are about two-thirds of the length of the labials. This prolongation and incurvature is said to be peculiar to the male after spawning †, and is accompanied by great enlargement of the teeth which are implanted in the intermaxillaries and knobbed extremity of the lower jaw. The *labials* are linear-lanceolate and straight: their posterior tips pass a little beyond the upper angle of the preoperculum, or within half an inch of the nape: the union between the two pieces of the labial is so complete that the suture cannot be distinguished. The under jaw is terminated by a dilated and slightly incurved knob which is armed with very strong hooked teeth: its articulation is about an inch posterior to the nape, and its length exceeds that of the upper surface of the head, including the snout, by about three quarters of an inch. The head, measured from the tip of the lower jaw to the edge of the suboperculum, forms one-fourth of the

\* *Watape* is the root of the pine-tree, and the kettle is a basket made of the flexible twigs woven so compactly together as to be water-tight.

† A specimen of a salmon, probably *Salmo hamatus*, once belonging to Donovan, and now in the British Museum, has a hooked nose very like that of *Salmo Scouleri*.

total length including the caudal, or if the measurement be made from the knob of the lower jaw to the tip of the central caudal rays, the head still constitutes one-fourth part.

**TEETH.**—There are nine very strong and considerably incurved teeth in a row on each *intermaxillary*, exclusive of four smaller ones which occupy the tip of the snout on both sides of the principal row. The *labials* are closely set with much smaller teeth in a single series, and the teeth on the limbs of the *lower jaw* are likewise close, numerous, and curved: those on the dilated knob of the jaw are very much curved and are the largest of all, being upwards of a quarter of an inch long. The *palatine* and *vomerine* teeth equal the posterior ones on the lower jaw in size, and are implanted in double rows: there are none on the anterior knob of the vomer. The *tongue* is long and narrow, and is armed with distant teeth on each side, about the size of those on the labials.

**GILL-COVERS.**—The posterior edge of the gill-cover is formed by the union of three small segments of large circles. The *operculum* is strongly marked with lines which radiate from its anterior upper angle: its lower edge slants downwards and forwards, so as to interpose itself between the preoperculum and *suboperculum*. The latter forms an acute spherical triangle, its convex side occupying nearly as much of the edge of the gill-cover as the operculum: the borders of both these bones are finely radiated. The *interoperculum* is shaped much as in other trouts, but its posterior angle reaches the edge of the gill-cover instead of being separated from it by the suboperculum as usual. The *preoperculum* is broad, being at its greatest width nearly equal to the operculum, and it is marked, as well as the adjoining part of the interoperculum, with close raised lines and furrows, very different from the short diverging tubular ridges of this bone in other trouts. The bones of the head, in general, have an unusually fibrous texture. *Gill-rays* flat, but narrower and shorter than in most other species: the longest are the central ones under the articulation of the jaw, the more posterior ones being a little shorter: there are 12 on the right side and 13 on the left.

**FINS.**—*Br.* 12—13; *P.* 16; *D.* 14—0; *V.* 11; *A.* 17; *C.* 19½.

The *pectorals* contain sixteen rays; the dorsal fourteen, the height of the fourth, fifth, or sixth, which are the longest, equalling the length of the attachment of the fin. The *adipose fin* is opposite to the three last rays of the anal. The *ventrals* are under the ninth, tenth, and eleventh dorsal rays. The *ventral appendages* are long, reaching to within one-third of the tips of the fin. The *anal* contains seventeen rays, the first one short, and the second nearly equalling the third, which is the longest; the last one is half as long as the third. The *caudal fin* has an unusually tapering base, and is forked at the end, the depth of the fork being half the length of the central rays; it contains nineteen rays exclusive of nine short basal ones above and below.

The **SCALES** are small and vary in form, some being oval, others four-sided with the corners rounded. They are most regular and closest on the tail, being in contact but not tiled: on the anterior part of the back they are separated by spaces equal to their own breadth, but on the sides they are not so far apart. Under the dorsal fin, and near the lateral line, a linear inch includes eleven scales, the intervening spaces occupying about one-third of the inch. There are 170 scales on the lateral line, and 70 in a vertical row anterior to the ventrals, of

which 30 are above the lateral line. The *lateral line* marked out by a small raised tube on the anterior part of each scale, is equidistant from the dorsal and ventral fins. The *anus* is situated at the commencement of the posterior third of the fish, caudal included.

		DIMENSIONS.			
		Inches.	Lines.		
Length from tip of snout to upper tip of caudal	29	0	Length of transverse axis of orbit	0	10½
" " base of central caudal rays	26	6	" lower jaw	5	4
" " commencement of dorsal	14	0	" toothed margin of ditto	2	5
" " edge of suboperculum	7	2½	" attachment of dorsal	3	1
" " nape	4	8	" longest ray of ditto	2	10
" " base of snout	4	0	" last ray of ditto	1	8½
" " lower tip of labial	5	0	" adipose fin	1	2
" " centre of pupil	3	8½	" pectorals	3	2
" " anterior edge of orbit	3	3	" ventrals	2	6
" from tip of lower jaw to lower tip of caudal	28	6	" ventral appendages	1	6
" " base of central caudal rays	26	0	" attachment of anal	2	9½
" " anus	19	0	" longest ray of ditto	1	9½
" " from centre of pupil to edge of gill-cover	3	7	" last ray of ditto	0	10½
" " from orbit to ditto	3	2	" central ray of caudal	1	6
" " of intermaxillary	2	1	" longest ray of ditto	3	7
" " labial	3	1	" lobes of ditto	4	6
" " vertical axis of orbit	0	8	Depth of caudal fork	1	0
			Distance between anus and base of caudal	6	2

The anadromous trout of the Columbia river are described by Lewis and Clark under the names of the *Common salmon*, *Red char*, and *Salmon-trout*, which they state to be inhabitants of both the seas and rivers.

"The COMMON SALMON are usually the largest, and weigh from five to fifteen pounds: they extend themselves into all the rivers and little creeks of this side of the continent (Pacific coast), and to them the natives are much indebted for their subsistence. They begin to run early in May. They are never caught with the hook, and we do not know on what they feed. The body of the fish is from two and a half to three feet long, and proportionably broad: it is covered with imbricated scales of a moderate size: the eye is large and the iris of a silvery colour: the pupil is black, the rostrum or nose extends beyond the under jaw, and both jaws are armed with a single row of long teeth, which are subulate and inflected near the extremities of the jaws, where they are also more closely arranged: there are some sharp teeth of smaller size, and the tongue, which is thick and fleshy, is armed with sharp points: the fins of the back are two; the first, placed nearer the head than the ventral fins, has several rays; the second, situated far back near the tail, has no rays. Both the fins and the belly are sometimes red, particularly in the male. The flesh of this fish, when in order, is of a deep flesh-coloured red, and every shade from that to orange-yellow; when very meagre it is almost white. The roes are in high estimation among the natives, who dry them in the sun, and preserve them for a great length of time: they are of the size of a small pea, nearly transparent, and of a reddish-yellow cast: they resemble very much, at a little distance, our common garden currants, but are more yellow.

"The RED CHAR are rather broader in proportion to their length than the Common

salmon : the scales are also imbricated, but rather larger, the rostrum exceeds the under jaw more, and the teeth are neither so large nor so numerous as those of the salmon. Some of them are almost entirely red on the belly and sides; others are much more white than the salmon; and none of them are variegated with the dark spots which mark the body of the other: their flesh, roes, and every other particular with regard to form, are those of the salmon.

“ Of the SALMON-TROUT we observe two species differing only in colour. They are seldom more than two feet in length, and much narrower in proportion than the salmon or red char. The jaws are nearly of the same length, and are furnished with a single series of small, subulate, straight teeth, not so long nor so large as those of the salmon. The mouth is wide, and the tongue is also furnished with small subulate teeth, in a single series on each side: the fins are placed much like those of the salmon. One of the kinds, of a silvery-white colour on the belly and sides, and a bluish light brown on the back and head, is found below the Great Falls, and associates with the red char in little rivulets and creeks. It is about two feet eight inches long, and weighs ten pounds. The eye is moderately large, the pupil black, with a small admixture of yellow, and the iris of a silvery-white, and a little turbid near its border with a yellowish-brown. The fins are small in proportion to the size of the fish. FINS.—*D.* 10—0; *P.* 13; *V.* 10; *A.* 12.—The other kind is of a dark colour on the back, and its sides and belly are yellow, with transverse stripes of dark brown: sometimes a little red is intermixed with these colours on the belly and sides towards the head. The eye, flesh, and roe are like those of the salmon. Neither this fish nor the salmon are caught with the hook, and we know not on what they feed. The white kind, found below the falls, is in excellent order when the salmon are out of season and unfit for use.” (LEWIS and CLARK, iii., p. 66—68.)

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[63.] 3. SALMO ROSSII. (Richardson.) *Ross's Arctic Salmon.*

*Salmo Rossii.* RICHARDSON, in *Nat. Hist. App. to Ross's Voyage*, p. lvi.  
Ekalook. ESQUIMAUX of *Boethia Felix*.

PLATE 80, one-quarter nat. size. PLATE 85, f. 2, head of nat. size.

This species is named in honour of a highly-valued friend, Captain James Clark Ross, an officer who has had the singular fortune of being engaged in five successive expeditions of discovery in the Arctic seas: whose professional skill, exertions, and perseverance, are the subjects of Sir Edward Parry's eulogium, and whose scientific acquirements and contributions to Natural History are so generally known, that any attempt of mine to commend him would be want of taste, were it not allowable for one who has also spent the prime of his life in the same regions and

in similar occupations, to add his meed of praise to retiring merit. To his friendship and liberality I owe the acquisition of this and three other trouts, taken in Regent's Inlet on his last expedition. The *Salmo Rossii* is so extremely abundant in the sea, near the mouths of the rivers of Boothia Felix, at certain seasons, that three thousand three hundred and seventy-eight individuals were obtained at one haul of a small-sized seine. They varied in weight from two to fourteen pounds, and rather exceeded, in the aggregate, six tons. In some the colour of the flesh was of a dark red, in others it was very pale, the dark ones being the firmest and best flavoured. As an article of food this salmon was much relished by the crew of the Victory. The *malma*, or *golet* of the Russians, which enters the rivers of Kamtschatka, agrees with the *Salmo Rossii* in its comparatively slender cylindrical form, scarlet spots on the sides, and the colours of some other parts; but we cannot, from the short notice of the *malma* by Pennant, offer an opinion respecting the identity or difference of the species. The habits of the two are evidently unlike, if it be true that the *malma* never congregates in shoals\*. The Greenlanders give the same name to the *Salmo carpio* of Fabricius, that *S. Rossii* receives from the Esquimaux of Boothia Felix; viz., *Eekalook*.

## DESCRIPTION

Of a dried specimen from Regent's Inlet.

FORM, as compared with the Common salmon, more slender, with a straighter back, much less arched forehead and shoulders, and slightly larger head. The remarkable length of the under jaw, and the truncated snout, give a peculiar appearance to the fish, and in conjunction with the nature of the scales, and the colour of the skin, readily characterise the species. *Head*, when viewed from above, appearing broad and flat, there being very little convexity either longitudinally or transversely. The *snout* is very obtuse. The head, measured as usual from the tip of the snout, is one-fifth of the whole length to the end of the scales on the caudal, and if the measurement be made from the tip of the lower jaw, which is an inch longer than the upper one, five lengths of the head reach to the extremities of the caudal. In the dried specimen there is a smooth median ridge extending from between the eyes to the nape, and an even lateral ridge on each side, commencing at the nostrils and curving down behind the orbit. A series of pores runs along the lateral ridge, and down the scapular bones to the lateral line; a row crosses the nape, another runs down the preoperculum, and lastly, one, beginning at the nostrils, curves under the orbit, and upwards to the middle of the lateral

\* "The *malma*, or *golet* of the Russians, grows to the weight of twenty pounds, and to the length of about twenty-eight inches. It is the most slender and cylindrical of all the genus. The head resembles that of a trout: the scales are very small: the back and sides bluish, with scattered spots of scarlet red: the belly white: ventral and anal fins red: tail slightly forked. It is sporadic, going dispersedly and not in shoals, ascends rivers to their very sources, feeds upon the spawn of other species, and grows very fat. The natives salt those they take in autumn, and preserve frozen those which are caught when the frost commences." (Arct. Zool. Intr., i., p. cxxvi.)

ridge, passing through the middle of the sub-orbital bones. These pores exist in other trouts, but are rendered conspicuous in this species by the prominence of the ridges with which they are connected. *Eye* equidistant from the tip of the snout and nape. The *orbit* has an oval shape, and the nostrils are rather nearer to it than to the tip of the snout. *Labials* thin and of a narrow lanceolate form. The distance from the snout to the tip of the labial reaches from the former to the nape, and extends beyond the posterior sub-orbital bones. The *lower jaw* is long, exceeding the length of the upper surface of the head by an inch and a quarter: its tip is a small incurvated knob. In the general form of the head the *S. Rossii* strongly resembles the British species figured in Plate 91, f. 2: it differs in the greater length of the jaws, in the whole margin of the intermaxillaries being toothed, and in other particulars readily discoverable by comparing the plates,—the British fish has an edentate depression at the extremity of the snout for the reception of the knob of the lower jaw.

**TEETH.**—In the only specimen I have had an opportunity of examining, part of the teeth have been injured and removed. They appear to have stood in a single series on the upper and lower jaws: the remaining ones are short, straight, and mostly obtuse, as if worn; there is also a single row of short, conical, but very acute teeth on each palate-bone; and though the vomer has been broken in preparing the specimen, two similar teeth remain on its anterior extremity, and one farther back. The teeth on the tongue, amounting to about thirty, are smaller and more crowded than the palatine ones; they form two or more rows across the tip and one down each side.

**GILL-COVERS.**—*Operculum* rhomboidal with the corners rounded, its height being nearly twice its breadth. The *suboperculum* has the same form in a different position, its length corresponding with the breadth of the operculum. Both these bones are marked with circular indented lines crossed by straight ones radiating from the centre. The posterior edge of the interoperculum is indented and somewhat concave. *Preoperculum* rather wide, its breadth being about half that of the operculum: on its middle there are raised diverging tubular ridges, and fine lines radiating from its centre to its posterior margin. The posterior edge of the gill-cover is inclined to the under one at an acute angle, the corner formed by the suboperculum being rounded. The *gill-rays* are flat, twelve on the right side and thirteen on the left.

**FINS.**—*Br.* 12—13; *D.* 13—0; *P.* 14; *V.* 10, *A.* 11; *C.* 21½.

The *dorsal* has thirteen rays, the first scarcely perceptible, the next also short, the third one quarter shorter than the fourth, which is the longest: the ninth ray is exactly opposite to the origin of the ventrals, and stands midway between the tips of the snout and of the central caudal rays: the last ray is divided to the base. The *adipose* fin is opposite to the penultimate anal ray. The *pectorals* are scimitar-shaped and contain fourteen rays. The *ventrals* have ten rays and the usual scaly appendages. The *anal* has eleven rays, of which the fourth and fifth are the longest. The *caudal fin* is forked, and contains twenty-one broad deeply-divided rays, with six short basal ones above and below.

**SCALES.**—This species differs remarkably from all the American trouts that have come under my observation (except, perhaps, *S. Hearnii*) in the scales. They are small, particu-



larly on the forepart of the back, where they are also most remote: and though rather larger and more crowded on the sides they are nowhere tiled, each scale being surrounded by a distinct space of smooth skin. Their general form is ovate or oval, and they are covered with a mucous skin, except a round or oval spot on the tip. The naked tips are larger on the sides, where they often assume a slightly crescentic form, and many of the scales there are truncated. As the skin dries the tips of the scales become elevated and rough to the touch. There are 134 scales on the lateral line, and 78 in a vertical row under the dorsal, 30 of them being above the lateral line. On the forepart of the body each scale on the lateral line corresponds to two rows above and below, so that there are in all between 240 and 250 rows on the sides. A linear inch includes about ten or eleven scales on most parts of the body. The *lateral line* is an inch nearer to the ridge of the back than to the upper ray of the ventral: it is formed by a series of ovate, dilated, acuminate scales, each having an elevated tube posteriorly, and a small pore on its tip. The distance between the anus and the base of the inferior caudal ray is contained two times and a half between the anus and gill-opening.

COLOUR.—The back, top of the head, dorsal and caudal fins, have a hue intermediate between oil-green and hair-brown; the cheeks are nacre, and the sides pearl-grey, with a blush of lilac and a silvery lustre; there are a number of scattered dots of carmine in the vicinity of the lateral line; the colour of the belly varies in different individuals from faded orange to tile-red and arterial blood-red. These colours are described partly from the dried skin and partly from two drawings made by Sir John Ross.

## DIMENSIONS

Of the dried specimen.

	Inches.	Lines.		Inches.	Lines.
Length from tip of upper jaw to tip of caudal	33	0	Length of lower jaw	4	7
"    "    end of scales	29	4	"    its toothed margin	2	6
"    "    anus	21	0	"    attachment of dorsal	3	0
"    "    commencement of dorsal	13	11	"    longest rays of ditto	3	9
"    "    tip of suboperculum	6	0	"    last ray of ditto	1	11
"    "    nape	3	5	"    pectorals	5	2
"    "    centre of pupil	2	2½	"    ventrals	4	2
"    "    orbit	1	9	"    ventral appendages	0	8½
"    "    tip of under jaw to tip of caudal	34	2	"    attachment of anal	2	2½
"    "    tip of suboperculum	6	10½	"    longest rays of ditto	3	6
"    "    centre of pupil to ditto	3	10	"    last ray of ditto	1	2½
"    "    posterior edge of orbit to ditto	3	4½	"    lobes of caudal	4	8
"    "    of transverse axis of orbit	0	10½	"    central rays beyond the scales	2	2
"    "    vertical axis of ditto	0	7	"    from anus to base of caudal	6	8
"    "    intermaxillary bone	0	11	Breadth of occiput	2	3
"    "    labial	2	10	"    between the orbits	2	0

[64.] 4. SALMO HEARNII. (Richardson.) *Coppermine River Salmon.*

*Salmo Hearnii.* RICHARDSON, *Franklin's First Journ.*, p. 706.

This, which is another anadromous trout, was taken in the Coppermine River and adjacent sea, on Sir John Franklin's First Expedition. Its flesh is red, and, though similar in flavour to that of the Common salmon, is, perhaps, less firm and more oily. Our party subsisted upon it for several days, but the Indians who then accompanied us, being unused to it, thought it unwholesome, and our Canadian voyagers were soon infected with the same apprehension. The well-known calamities that befell us on our return, prevented me from bringing home specimens of the fish, and I can introduce the species to naturalists, only through the medium of a description hastily drawn up on the spot, which does not altogether coincide with the account of any other salmon that I have seen or read of. The affecting story related by Hearne, of the slaughter of a poor old Esquimaux woman, by the Indians of his party, while she was engaged in taking this salmon at a cascade near the mouth of the Coppermine, subsequently named, from the transaction, Bloody-fall, may be appropriately quoted here; as it contains the earliest notice of the fish, and, indeed, the only one previous to the publication of Sir John Franklin's narrative.

“ It ought to have been mentioned in its proper place, that in making our retreat up the river, after killing the Esquimaux on the west side, we saw an old woman sitting by the side of the water taking salmon, which lay at the foot of the fall as thick as a shoal of herrings. Whether from the noise of the fall, or a natural defect in the old woman's hearing, it is hard to determine, but certain it is, she had no knowledge of the tragical scene which had been so lately transacted at the tents, though she was not more than two hundred yards from the place. When we first perceived her, she seemed perfectly at ease, and was entirely surrounded by the produce of her labour. From her manner of behaviour, and the appearance of her eyes, which were as red as blood, it is more than probable that her sight was not very good, for she scarcely discerned that the Indians were enemies till they were within twice the length of their spears of her. It was in vain that she attempted to fly, for the wretches of my crew transfixed her to the ground in a few seconds, and butchered her in the most savage manner. There was scarcely a man among them who had not a thrust at her with his spear; and many in doing this

aimed at torture rather than immediate death, as they not only poked out her eyes, but stabbed her in many parts remote from those which are vital. It may appear strange, that a person supposed to be almost blind should be employed in the business of fishing, and particularly with any degree of success; but when the multitude of fish is taken into account, the wonder will cease. Indeed, they were so numerous at the foot of the fall, that when a light pole, armed with a few spikes, which was the instrument the old woman used, was put under water and hauled up with a jerk, it was scarcely possible to miss them. Some of my Indians tried the method with the old woman's staff, and seldom got less than two or three at a jerk, sometimes three or four. These fish, though very fine and beautifully red, are but small, seldom weighing more, as near as I could judge, than six or seven pounds, and in general much less. Their numbers at this place were almost incredible, perhaps equal to anything that is related of the salmon in Kamtschatka, or any other part of the world."—After murdering the helpless old woman, together with upwards of twenty of her countrymen, and destroying all the property left at their tents, the party sat down to feast on the salmon, or, in the words of our author, "After the Indians had completed this piece of wantonness, we sat down and made a good meal of fresh salmon." (Hearne, Journ, &c., p. 158.)

## DESCRIPTION

Of a recent fish taken at Bloody-fall, Lat. 67° 42½' N., on July 16, 1821.

COLOUR.—Back olive-green; sides pale; belly bluish; several longitudinal rows of flesh-red spots on the back and sides, largest on the latter, where they are as big as a pea; cheeks and gill-covers nacre. SCALES firmly imbedded in a mucous skin and very small, but possessing much pearly lustre.

FORM like that of the Common salmon, with a proportionably larger head. *Eyes* small, situated opposite to the middles of the labials, and half an inch above their toothed edges. *Nostrils* midway between the eye and end of the snout. The *intermaxillaries* form a comparatively small portion of the margin of the mouth, and project somewhat from the rest of the jaw: the *labials* are strap-shaped. The *lower jaw* terminates in a small knob, which is received into a depression in the intermaxillaries. The gill-membrane contains ten oblique rays: the openings are wide.

TEETH subulate, in a thin row on the labials and lower jaw: a solitary tooth of the same size stands on each side of the intermaxillary notch: there are likewise rows of teeth on the palate-bones, a few on the anterior part of the vomer, and some stronger ones on the tongue, all subulate.

FINS.—*Br.* 10; *D.* ; *V.* ; *A.* 10\*; *C.* .

\* In the Appendix to Sir John Franklin's First Journey, the anal is stated to have 18 rays, from an error in the transcription of my original notes.

The space between the *anal* and caudal is greater than the length of the base of the former. The *caudal* is large and very entire, being truncated with a slight rounding of the angles. The *dorsal* is opposite to the ventrals.

INTESTINES similar to those of the trouts; stomach rather small: between thirty and thirty-six cylindrical *cæca* from one to two inches long.

[65.] 5. SALMO ALIPES. (Richardson.) *Long-finned Char.*

GENUS, Salmo. CUV. Sub-genus, Salvelinus. NILSSON.  
Salmo alipes. RICHARDSON, *Nat. Hist. App. Ross's Voy.*, p. lvii.

PLATE 81, One-third nat. size, and PLATE 86, f. 1, the head of the nat. size.

This trout evidently belongs to the *Salvelini*, or Chars, a sub-generic group characterised by the smallness of the scales and the arrangement of the vomerine teeth in a cluster on the anterior extremity of the bone, without running backwards along a median ridge in a single or double row. The European chars have a peculiarly neat aspect from their small bright scales; and in the spawning season their bellies generally assume a deep red or orange colour, agreeing in these respects with the majority of the American trouts that have come under our notice. The *Salmo alipes*, though it differs from *S. Rossii* in the smooth manner in which the scales are imbedded in the skin, in the relative proportion of the jaws, and in other particulars, resembles it closely in the general form, and especially in the shape of the various bones of the face and gill-covers. It is remarkable for the great length of its fins, but in the opinion of M. Agassiz this cannot be regarded as a specific distinction, trouts inhabiting rapid, rocky streams, having their fins always much developed. Our specimen was taken with many other individuals in a small lake which discharges itself into Prince Regent's Inlet by a stream about half a mile long. It most probably visits the sea, though the fact of its doing so was not ascertained. Several *brachiellæ* adhered to the inside of its under jaw. The Esquimaux of Boothia Felix included it with several other kinds of trout, under the general appellation of *eekalook-peedeook*.

DESCRIPTION

Of a prepared specimen from a small lake in the peninsula of Boothia.

FORM slender. The *head* forms more than a fifth of the total length, caudal included: it is convex above, both in profile and transversely, the cranial ridges being similar to those of *S. Rossii*, but more prominent and acute. *Snout* very obtusely rounded, receiving the knobbed

extremity of the lower jaw in a toothless space. *Orbit* ovate, situated twice its length from the end of the snout, and about three lengths and a half from the posterior edge of the gill-cover: its transverse axis is contained six times and a half in the total length of the head, but rather less than four times in the distance between the tip of the snout and nape of the neck: its upper margin is marked, in the dried specimen, by a few raised diverging lines. *Nostrils* twice as near to the orbit as to the end of the snout. *Jaws* nearly equal, the lower one appearing longer than the other when depressed. *Intermaxillaries* one-third of the length of the labials, each containing four teeth. *Labials* of medium length, thin and slightly curved, so as to approach the form of an italic *f*; their appophyses do not reach quite to their tips, and are as broad again as the limb of the bone to which they are attached. The distance from the tip of the snout to the posterior end of the labial nearly equals the length of the upper surface of the head. *Lower jaw* moderately strong, tipped by a small knob, and extending about half an inch beyond the snout, when depressed to the utmost.

**TEETH.**—The labials, intermaxillaries, and lower jaw are armed with short, conical, acute, and very slightly-curved teeth in a single series: there is also a row of rather larger teeth intermixed with smaller ones on the elevated outer edge of each palate-bone, and a projecting cluster of six or seven on the knob of the vomer, the posterior part of that bone being flat, smooth, and toothless. The *tongue* has six teeth in a row on each side, equal in size to those on the jaws, and three or four clustered rows of smaller ones on its tip: it is smooth in the centre.

**GILL-COVERS.**—The forms of the opercular pieces, though similar to those of *S. Rossi*, differ in their relative dimensions, the breadth of the operculum being greater in proportion to its height, while that of the suboperculum is less: the preoperculum is also wider. There are twelve flat gill-rays on the left side, and eleven on the right.

**FINS.**—*Br.* 11—12; *P.* 15; *D.* 13—0; *V.* 9; *A.* 10 or 11; *C.* 19½.

The *pectorals* contain fifteen rays, and twice their length reaches from the gill-opening to the middle of the ventrals. The *ventrals*, when turned back, almost touch the anus. The fifth *dorsal* ray is the longest, the first one being minute: the attachment of the fin is two-thirds of its height. The adipose fin is opposite to the last rays of the anal. The *anal* is small in proportion to the dorsal, its rays being about one-fourth shorter than those of the latter. The *caudal* is forked: it contains nineteen broad deeply-divided rays, and six short basal ones above and below. The eighth dorsal ray is midway between the tip of the snout and extremities of the central rays of the caudal.

**SCALES** small, thin, and roundish, firmly and smoothly imbedded in the skin: they are mostly in contact but not tiled, those on the back small and more remote; they are also small on the belly, but more crowded and of an oval form: on the sides they are somewhat truncated. The *lateral line* is formed of 126 scales similar to those of *S. Rossi*; there are about 285 scales in a row close to the lateral line, and 70 in a vertical row anterior to the ventrals 29 of which are above the lateral line, and ten below the upper edge of the ventral. The anterior scales on the lateral line are so large and remote, that they correspond to two or three of the rows which descend from the back.

COLOUR, as far as one can judge from the dried skin, hair-brown on the upper parts, the sides paler with yellowish marks, the belly white or yellow, and the under fins orange with some darker streaks.

DIMENSIONS  
Of the dried specimen.

		Inches.	Lines.			Inches.	Lines.
Length from tip of upper jaw to extremities of caudal . . . . .	26	10	Length of lower jaw . . . . .	3	9		
" " end of scales on caudal . . . . .	24	3	" toothed margin of lower jaw . . . . .	2	3		
" " anus . . . . .	17	6	" attachment of dorsal . . . . .	2	8		
" " commencement of dorsal . . . . .	11	4	" its longest ray . . . . .	3	8		
" " edge of suboperculum . . . . .	5	6	" its last ray . . . . .	2	4½		
" " nape . . . . .	3	5	" pectorals . . . . .	4	8½		
" " centre of pupil . . . . .	2	2	" ventrals . . . . .	3	11		
" " edge of orbit . . . . .	1	8	" ventral appendages . . . . .	0	7½		
" " under jaw to tips of caudal . . . . .	27	0	" attachment of anal . . . . .	1	8½		
" " edge of suboperculum . . . . .	5	8½	" its longest ray . . . . .	3	0		
" from centre of pupil to ditto . . . . .	3	6	" its last ray . . . . .	1	4½		
" from posterior angle of orbit to ditto . . . . .	3	1	" longest caudal rays . . . . .	3	6½		
" of transverse axis of orbit . . . . .	0	9½	" central ditto . . . . .	1	10½		
" vertical axis of ditto . . . . .	0	7	Breadth of occiput . . . . .	2	0		
" intermaxillary bone . . . . .	0	9½	" between orbits . . . . .	1	8½		
" labial . . . . .	2	7	Distance between anus and tip of caudal . . . . .	9	4		
			Depth of body at the dorsal . . . . .	3	8		

[66.] 6. SALMO NITIDUS. (Richardson.) *The Angmalook.*

*Salmo nitidus.* RICHARDSON, *Nat. Hist. App. Ross's Voy.*, p. lvii.  
Angmalook. ESQUIMAUX.

PLATE 82, f. 1, one-third nat. size. PLATE 86, f. 2, head of nat. size.

This Char was found in the same lake with the preceding one, to which it is similar in the size and form of its head, and in the general appearance of its scales. If one may judge, however, from the inspection of a single prepared specimen of each, it has a thicker body, shorter upper jaw, and shorter fins. It is possible that these differences may be owing to age or individual variation, but the colours appear also to be dissimilar: hence it seems safer to describe the *angmalook* as a distinct species.

DESCRIPTION.

FORM.—*Back* nearly straight as in *S. alipes*, but the body is thicker, the belly more prominent, and the fins shorter. The middle of the tip of the snout and of the central caudal ray falls under the ninth dorsal ray, and a very little posterior to the origin of the ventrals. The

adipose fin is placed at the commencement of the fourth quarter of the fish, including the lobes of the caudal, and the anus is nearly twice as far distant from the snout as from the latter, being consequently farther back than in *S. alipes*. *Head* less arched above, both in profile and transversely, than in *S. alipes*: the mesial ridge and lateral porous curves are less prominent, and there are no radiating lines above the orbit: the head forms less than a fifth part of the entire length of the fish. The ovate *orbit* is the length of its axis and a half from the tip of the snout, and three lengths and a half from the posterior edge of the gill-cover, being proportionally nearer the snout than in *S. alipes*: six diameters of the orbit are equal to the extreme length of the head. In this, as in *S. alipes*, the upper surface of the head measures just the same with the distance of the posterior edge of the suboperculum from the centre of the pupil, while in *S. Rossii* the top of the head is half a diameter of the orbit shorter. The nostrils are a little nearer to the eye than to the tip of the snout. The upper jaw is shorter than in *S. alipes*. The *snout* is rounded, and there is a small edentate space for the reception of the slightly-knobbed extremity of the lower jaw, which is a little shorter than the upper one when the mouth is shut, and scarcely surpasses it when the jaws are open. The *intermaxillaries* are less than one-third of the length of the *labials*; and the latter are shorter, stronger, and less curved than in *S. alipes*. The total length of the lower jaw exceeds the distance between the tip of the snout and nape by about two lines.

**TEETH** as in *S. alipes*, the cluster on the knob of the vomer being, however, less prominent and not so crowded: the form of the cluster is triangular, three teeth wide anteriorly, and one tooth in the posterior angle.

**GILL-COVERS.**—The opercular bones greatly resemble those of *S. Rossii* and *alipes*, though the breadth of the *operculum* is less, being only half its height, and but just equal to the greatest width of the *preoperculum*. The height of the suboperculum is half its length. There are eleven *gill-rays* on the right side, and twelve on the left.

**FINS.**—*Br.* 11—12; *D.* 14—0; *P.* 17; *V.* 10; *A.* 12; *C.* 19 $\frac{1}{2}$ .

The fifth and sixth *dorsal* rays are the longest, the first being scarcely perceptible. The attachment of the *anal* is equal in length to the space between it and the base of the caudal. The *adipose* fin is opposite to the last rays of the anal.

**SCALES** tiled, small, roundish: truncated on the sides: smaller and more pointed on the belly. There are 120 on the lateral line of a larger size, and about 270 in a row adjoining to that line, or 19 in a linear inch under the dorsal: a vertical row there contains 92, of which 36 are above the lateral line, 42 betwixt it and the ventral, and 12 or 14 below the first ray of the latter.

**COLOUR**, according to Captain J. C. Ross, as follows: "Body above the lateral line deep green, softening towards the belly, which is of a beautiful yellowish-red tint posterior to the pectoral fin: throat and region of the pectorals white, slightly clouded by yellowish-red. There are several rows of ocellate red spots, confined principally to the space between the lateral line and yellowish-red of the belly: they vary in size, the largest being as big as a pea. Dorsal fin coloured like the back. Under fins dusky-red, the anal paler, and the first rays of the pectorals, ventrals, and anal white."

DIMENSIONS  
Of the prepared specimen.

	Inches.	Lines.		Inches.	Lines.
Length from tip of upper jaw to upper extremity of caudal . . . . .	20	4	Length of last ray of dorsal . . . . .	1	3
" " end of central caudal rays . . . . .	19	6	" adipose fin . . . . .	0	7
" " end of scales on ditto . . . . .	18	3	" pectorals . . . . .	3	5
" " anus . . . . .	13	6	" ventrals . . . . .	2	10
" " beginning of dorsal . . . . .	8	3	" ventral appendages . . . . .	0	7
" " edge of suboperculum . . . . .	4	3½	" longest ray of anal . . . . .	2	3
" " nape . . . . .	2	8	" last ray of ditto . . . . .	1	0
" " centre of pupil . . . . .	1	7	" attachment of ditto . . . . .	1	5½
" " edge of orbit . . . . .	1	3	" lobes of caudal . . . . .	3	4½
" " centre of pupil to edge of suboperculum . . . . .	2	8½	" longest rays of ditto . . . . .	3	0
" " posterior angle of orbit to ditto . . . . .	2	5	" central rays of ditto . . . . .	1	6
" " of transverse axis of orbit . . . . .	0	8½	Depth of caudal fork . . . . .	0	8
" " vertical ditto . . . . .	0	5	Distance between anus and tip of caudal . . . . .	7	2
" " intermaxillary . . . . .	0	6½	" " between anal or adipose fin and base of caudal . . . . .	2	0
" " labial . . . . .	1	10½	" ditto or ditto to end of scales on lateral line . . . . .	3	3
" " lower jaw . . . . .	2	9	Depth of body at the dorsal . . . . .	3	6
" " toothed margin of ditto . . . . .	1	5	Breadth of occiput . . . . .	1	7½
" " attachment of dorsal . . . . .	2	3	" " between the orbits . . . . .	1	5
" " longest rays of ditto . . . . .	2	6			

[67.] 7. SALMO HOODII. (Richardson.) *The Masamacush.*

The Masamacush. HUTCHINS'S *Mem.*

Salmo Hoodii. RICHARDSON, *Nat. Hist. App. Ross's Voy.*, p. lviii.

PLATE 82, f. 2. PLATE 83, f. 2, one-third nat. size. PLATE 87, f. 1, head nat. size.

This Char, well known in the fur countries by its Cree appellation of Masā-mècoos, is common in every river and lake from Canada to the northern extremity of the continent. It is voracious, and readily takes a cod-hook baited with a piece of sucking-carp, pork, deer's heart, or the belly of one of its own species. We took many at Fort Enterprise in March, in gill-nets set under the ice, in the neighbourhood of an open rapid by which the waters of Winter Lake were discharged into a river that remained frozen up until June. At that time their stomachs were filled with the larvæ of insects. During the summer this fish is supposed to retire to the depths of the lakes, but it reappears in smaller numbers in the autumn, and is occasionally taken in the winter in nets, but seldom, by the hook, except in the spring. The spawning season is in April or May, judging from the great development that the spawn then acquires, though the spawning beds are unknown to us. The *masamacush* attains a weight of about eight pounds, but begins to spawn before it weighs more than two or three.

Two representations are given of this species, the one (Plate 82, f. 2) being



copied from a coloured drawing by Lieutenant Hood, of a recent fish taken in Pine Island Lake, lat. 54°, the other is of a dried specimen, brought from Boothia Felix by Captain James Clark Ross, who took it in a small lake. The figure of the latter (Plate 83, f. 2), and particularly that of the head in Plate 87, f. 1, exhibit the correct forms of the opercular bones, and the relative size of the head and other parts which were not so rigidly attended to in Mr. Hood's spirited drawing. The arctic fish differs a little from the one common in the more southern parts of the fur countries, in having shorter labials, more crowded and brighter scales, with a different arrangement of colours, and longer fins; but the proportions of the other parts are so nearly the same, that I have not ventured to separate them in the absence of a comparison of their internal structure. The shortness of the head distinguishes *S. Hoodii* from the two preceding species, to which its general resemblance is very close. For the purpose of comparison I have added the dimensions of a British Char in Mr. Yarrell's possession. That specimen, as well as the one from Llyn Cawellyn, the head of which is represented in Plate 92, f. 5, has shorter labials, and a larger eye than any of the American Chars which I have seen.

## DESCRIPTION

Of a specimen from Boothia Felix.

**FORM.**—The *body* is more slender than that of *S. nitidus*, and the head is a little more than a sixth of the total length, caudal included. The *orbit* is nearer the end of the snout than in *S. nitidus*, the intermaxillaries are shorter, and the labials shorter and somewhat wider. The *lower jaw*, when the mouth is closed, projects beyond the upper one by the depth of the chin, and it appears still longer when the mouth is open: its length, applied to the upper surface of the head, passes about a quarter of an inch beyond the nape.

**TEETH** smaller than in *S. nitidus*, but otherwise very similar, except on the tongue, that organ being armed with a single row on each side which meet in a curve at its tip: there are also two or three scattered teeth on the centre of the tongue, but no double or triple rows anteriorly.

**GILL-COVERS.**—The *operculum* is narrow, its transverse diameter being scarcely half its height. The height of the suboperculum exceeds half its length or transverse diameter.

**SCALES** much like those of *S. nitidus* but somewhat brighter. There are 126 on the lateral line, 268 in a row immediately above it, 53 in a vertical row before the ventrals, of which 12 are below the first ray of that fin, and 28 above the lateral line.

**FINS.**—*Br.* 10—11; *D.* 12—0; *P.* 15; *V.* 10; *A.* 11; *C.* 19½. From Boothia Felix.

*Br.* 10—11; *D.* 12—0; *P.* 13; *V.* 8; *A.* 10; *C.* 19½. From Mingan River.

A larger individual from Mingan River, which falls into the estuary of the St. Lawrence, differs from the preceding in having more remote scales, there being only 120 on the lateral line: shorter labials: shorter fins; and caudal even at the end. In other respects the resemblance is complete. The Mingan River fish is the ordinary form of the *masamacush*, and the one from Boothia Felix ought, perhaps, to be considered as a variety with longer fins, arising

from the nature of the rapid, rocky streams which it frequents: it is not, however, unlikely that an examination of recent specimens may reveal differences of internal structure sufficient to prove it to be a distinct species. A female specimen of the masamacush, taken in a small lake a little to the northward of the 64th parallel of latitude, on the 16th of August, exhibited the following tints of colour. Back and sides intermediate between olive-green and clove-brown, bestudded with yellowish-grey spots as big as a pea: a few of these spots on the gill-covers. Belly and under jaw white, the latter thinly dotted with bluish-grey. Dorsal and upper lobe of the caudal marked with smaller spots. Irides honey-yellow. Scales rather dull. This individual was twenty-one inches long, its flesh was red, and its roe but little developed. The intestines had the structure usual in the trouts, the cæca were numerous, their insertions occupying about three inches of the length of the canal, the *valvulæ conniventes* occupied two inches, and there was about an inch of smooth gut next the anus. The liver, small and triangular, had several small incisions on its inferior edge. The rakers and pharyngeal bones were armed with short teeth like velvet pile.

## DIMENSIONS.

	From Mingan River.		From Boothia Felix.		British Char.	
	In.	ln.	In.	ln.	In.	ln.
Length from tip of snout to tip of caudal . . . . .	24	0	20	6	18	3
"          "          end of central caudal rays . . . . .	23	9	19	6	17	7
"          "          end of scales on ditto . . . . .	22	2	18	2	17	0
"          "          anus . . . . .	16	7	13	9	11	10
"          "          beginning of dorsal . . . . .	10	2	8	5	7	7
"          "          edge of suboperculum . . . . .	4	2	3	8	3	0
"          "          nape . . . . .	2	9	2	2	1	11
"          "          centre of pupil . . . . .	1	6 $\frac{1}{2}$	1	4 $\frac{1}{2}$	1	2
"          "          edge of orbit . . . . .	1	3	1	0	0	10 $\frac{1}{2}$
"          "          lower jaw, depressed, to tip of caudal . . . . .	24	8	20	9	0	0
"          "          edge of suboperculum . . . . .	4	4	3	9 $\frac{1}{2}$	0	0
"          "          centre of pupil to edge of suboperculum . . . . .	2	6 $\frac{1}{2}$	2	4 $\frac{1}{2}$	0	0
"          "          posterior edge of orbit ditto . . . . .	2	3	2	1 $\frac{1}{2}$	0	0
"          "          of transverse axis of orbit . . . . .	0	9	0	8 $\frac{1}{2}$	0	6 $\frac{1}{2}$
"          "          vertical ditto . . . . .	0	5	0	5 $\frac{1}{2}$	0	0
"          "          intermaxillary . . . . .	0	7	0	5	0	4
"          "          labial . . . . .	2	1 $\frac{1}{2}$	1	6 $\frac{1}{2}$	1	3
"          "          lower jaw . . . . .	3	1	2	5	1	10
"          "          toothed edge of ditto . . . . .	1	8	1	2	0	0
"          "          attachment of dorsal . . . . .	2	4	1	11	1	11
"          "          longest rays of ditto . . . . .	2	2	2	4 $\frac{1}{2}$	2	2
"          "          its last ray . . . . .	1	1	1	4	1	0
"          "          adipose fin . . . . .	0	7 $\frac{1}{2}$	0	5	0	7
"          "          pectorals . . . . .	2	4 $\frac{1}{2}$	3	2	2	4
"          "          ventrals . . . . .	2	0	2	3	2	0
"          "          ventral appendages . . . . .	0	7 $\frac{1}{2}$	0	7	0	0
"          "          attachment of anal . . . . .	1	8	1	5 $\frac{1}{2}$	1	3
"          "          longest ray of ditto . . . . .	2	4	2	2	2	2
"          "          its last ray . . . . .	0	9 $\frac{1}{2}$	0	11	0	0
"          "          lobes of caudal . . . . .	3	6	3	8 $\frac{1}{2}$	0	0
"          "          longest rays of ditto . . . . .	2	6	3	0	2	7
"          "          its central ray (from end of scales) . . . . .	0	7 $\frac{1}{2}$	1	4 $\frac{1}{2}$	1	5
Depth of caudal fork . . . . .	0	0	1	1	0	7
Distance between anus and tip of caudal . . . . .	7	10	7	4	6	0
"          "          anal and lower tip of ditto . . . . .	6	0	5	7 $\frac{1}{2}$	0	0
"          "          adipose and upper tip of ditto . . . . .	5	5	5	8 $\frac{1}{2}$	0	0
Depth of body at the dorsal fin . . . . .	3	6	3	4	3	6
Breadth of occiput . . . . .	1	7 $\frac{1}{2}$	1	6	0	0
"          "          between the orbits . . . . .	1	5	1	1	0	0

[68.] 8. SALMO FONTINALIS. (Mitchill.) *New York Char.*Common Trout (*Salmo fontinalis*). MITCHILL, *New York Ph. Tr.*, i., p. 435.

PLATE 83, f. 1, half nat. size. PLATE 87, f. 2, head nat. size.

Dr. Mitchill describes this trout in the paper above referred to, making the following observations upon it. "He is reckoned a most dainty fish. They travel away to Hempstead and Islip for the pleasure of catching and eating him. He is bought at the extravagant price of a quarter of a dollar for a single fish, not more than ten or twelve inches long. He lives in running waters only, and not in stagnant ponds; and therefore the lively streams, descending north and south from their sources on Long Island, exactly suit the constitution of this fish. The heaviest Long Island trout that I have heard of weighed four pounds and a half." One caught near New York, measuring twenty-four inches in length, weighed four pounds eight ounces: the average weight of those usually caught is about three-quarters of a pound. No opportunity occurred during the progress of the expedition of obtaining this trout in a recent state, but Mr. Todd kindly sent me a prepared specimen from Penetanguishene. He states that it ascends the rivers from Lake Huron in the month of May, and readily takes the hook during the summer; that the flesh is red, and that he never saw one exceeding the weight of a pound and a half. Mr. Todd's specimen was submitted to the inspection of Baron Cuvier, who returned it with the following remark: "*Il nous parait bien nommé Salmo fontinalis de Mitchill. C'est probablement le Salmo Gædenii de Bloch.*" The latter synonym appears very strange, and must have originated in some mistake, for not to mention other differences, the *S. Gædenii* has tolerably large scales, while the scales of *S. fontinalis* are so small, that in Dr. Mitchill's description the skin is said to be "scaleless." The *S. Gædenii* inhabits the Baltic, and is considered by M. Agassiz to be the young of the Common salmon. The *Salmo fontinalis* may be readily distinguished from the other species that we have already described, by the smallness of its scales, the shortness of its intermaxillaries, and the length and narrowness of the labials, exclusive of its colours, which are peculiar.

## DESCRIPTION

Of a prepared specimen from Penetanguishene, on Lake Huron.

FORM thickish. *Head* rather small, being contained five times and one-fifth in the total length. *Mouth* large. *Jaws* of equal length. *Intermaxillaries* very short, being scarcely a quarter as long as the *labials*. The latter are long, linear, and straight, with still narrower

appophyses; their tips go beyond the posterior orbital-bones and reach nearly to the articulation of the lower jaw. The distance between the tip of the snout and the extremity of the labial equals the length of the upper surface of the head, and the *lower jaw* is about two lines longer.

TEETH rather long, slender, acute, and slightly curved, those on the labials smaller: the palatine teeth run far back on a slightly prominent ridge, and there is a triangular cluster of about ten teeth on the anterior part of the vomer. The tongue is armed with six teeth on each side.

GILL-COVERS.—*Interoperculum* short and triangular. *Preoperculum* narrow and much curved, with an even edge. The *suboperculum* is half as high as the operculum, and its angle touches the preoperculum. The right *gill-membrane* contains twelve rays.

FINS.—*Br.* 12; *P.* 13; *D.* 11—0; *V.* 8 or 9; *A.* 10; *C.* 19½.

The fifth *dorsal* ray is the longest, the first being almost imperceptible in a recent fish. The *adipose* fin is about its own breadth behind the *anal*. The latter equals, or rather exceeds the dorsal in the length of its rays, and is more remote from the caudal than usual, there being almost twice the length of its insertion between it and the base of the latter.

SCALES small, roundish, in contact, but not tiled, and firmly imbedded in a mucous epidermis which almost conceals them: they are smallest on the forepart of the belly. There are 244 rows of scales meeting at the *lateral line*, which contains only 116: these are longer than the ordinary scales, and have each a mucous canal elevated above its surface. A vertical row under the dorsal contains 95 scales, viz., 41 above the lateral line, 42 between it and the upper edge of the ventral, and 12 below the level of the first ray of that fin.

COLOUR.—(" Back mottled, pale and brown: sides dark brown with yellow and red spots above and below the lateral line, the yellow surrounding the red, which appears like scarlet dots: sides of the belly orange-red: lowest part of the abdomen whitish with a smutty tinge. First rays of the pectoral, ventral, and anal fins white, the second black, the rest purplish-red: dorsal fin mottled with yellowish and black. Eyes large and pale." Dr. Mitchell.)

DIMENSIONS  
Of a prepared Lake Huron specimen.

	Inches.	Lines.		Inches.	Lines.
Length from tip of snout to tip of caudal	. 14	3	Length of attachment of dorsal	. 1	4
" " end of central caudal rays	14	0	" its longest rays	. 1	5½
" " end of scales	. 13	0	" its last ray	. 0	8
" " anus	. 9	2	" adipose fin	. 0	5
" " commencement of dorsal	. 5	10	" pectorals	. 1	8½
" " edge of suboperculum	. 2	9	" ventrals	. 1	4
" " nape	. 1	8½	" ventral appendages	. 0	4½
" " centre of pupil	. 0	11	" attachment of anal	. 1	1
" " edge of orbit	. 0	9	" its longest ray	. 1	7½
" from centre of pupil to edge of suboperculum	. 1	10½	" its last ray	. 0	6
" posterior edge of orbit to ditto	1	7½	" lobes of caudal	. 2	0
" of transverse axis of orbit	. 0	5½	" its longest rays	. 1	8
" vertical ditto	. 0	4½	" its middle rays	. 1	0
" intermaxillary	. 0	4	Depth of caudal fork	. 0	5
" labial	. 1	5	Distance from anus to tip of caudal	. 5	1
" lower jaw	. 1	9	" anal to lower caudal tip	. 4	0
" toothed margin of ditto	. 0	11	" adipose to upper tip of caudal	. 3	7
			Depth of body at the dorsal	. 1	8

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The *Salmo fontinalis* is probably what is called in the narrative of Lewis and Clark's Journey to the Pacific, the MOUNTAIN, or SPECKLED TROUT of the United States. Another species, which inhabits the upper waters of the Missouri and Columbia, is thus described in the same work. "We caught in the Falls half a dozen trout resembling in form and the position of the fins, the *mountain*, or *speckled trout* of the United States, except that the specks of the former are of a deep black colour, while those of the latter are of a red or gold colour: they have long sharp teeth on the palate and tongue, and generally a small speck of red on each side, behind the front ventral fins; the flesh is of a pale yellowish red, or, when in good order, of a rose-coloured red. We never saw this fish below the mountains, but from the transparency and coldness of the Kooskooskee, we should not doubt of its existence in that stream, as low as its junction with the south-east branch of the Columbia. It is not so abundant in the Columbia as in the Missouri." (i., p. 358, and iii., 601.)

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I am unable to decide from Fabricius's account of the Greenland trouts, whether they are identical with any of those described above, or whether they ought to be reckoned as distinct species. His *S. CARPIO*, named *Eekallook*, *Kebleriksoak*, *Satooack*, and *Sardloak*, by the natives, is probably *S. Hoodii*. It is an inhabitant of the rivers, lakes, estuaries and bays of Greenland, and feeds upon caplin, herrings, sticklebacks, small crabs, worms, and spawn of fishes. It is named *Lax*, or the Salmon, in the histories of Greenland, and is supposed by Fabricius to be the same with the *Kundsha* of Pallas, a trout which abounds in the gulfs of the Icy Sea and of Kamtschatka, but is said not to ascend rivers.

Another Greenland trout with an orange belly, named by the natives *Eekallook* and *Iviksarok*, was considered by Fabricius to be the same species with his *S. carpio*, but he changed his opinion, in some degree, after leaving the country, and referred it to the *S. ALPINUS* of Linnæus, when he had no longer an opportunity of comparing it with *carpio*. It congregates with the preceding, and may possibly be the trout I have described under the specific name of *S. nitidus*, the tawny-orange colour of the belly in both being confined to the spawning season.

The *S. stagnalis* (*Fauna Grænl.*, p. 175) agrees best with our *S. alipes*. It inhabits alpine waters, and never descends to the sea. It is named *Eekallookak*.

The *SALMO RIVALIS* (*Fauna Grænl.*, p. 176), named by the Greenlanders *Aunardlek* and *Eekalloogak*, if it be not the young of some of the preceding, is most probably distinct from any that we have described. In the minuteness of its scales it resembles *S. fontinalis*. It inhabits rivulets and ponds, feeds upon insects, and buries itself in the mud in the winter, where it is frozen up, never visiting the sea. It is only six inches long. The word *Eekallook* seems to be the general Greenland and Esquimaux name for the trouts of the middle or smaller size.

[69.] 9. *SALMO NAMAYCUSH.* (Pennant.) *The Namaycush.*

*Namaycush.* HUTCHINS'S *Mss.*, p. 115.

*Salmon namaycush.* PENN., *Arct. Zool.*, ii, *Suppl.*, p. 139, No. 165; and *Intr.*, p. cxli.

*Salmo amethystus.* MITCHELL, *Journ. Ac. Sc. Phil.*, i., p. 419. *An.* 1818.

NAMMËCOOS. CREE INDIANS. THLOOESINNEH. CHEPFWYANG. Keyteeleek.

ESQUIMAUX. Salmon-trout. CANADIANS.

PLATE 79, one-third nat. size. PLATE 85, f. 1, head nat. size.

This magnificent trout, which equals or surpasses the Common salmon in size, is a denizen of all the great lakes that lie between the United States and the Arctic Sea, but it does not exist, as far as I have been able to ascertain, in any tidal waters. According to the report of fishermen on Lake Huron, seventeen pounds is its average weight, but they occasionally capture individuals weighing sixty pounds; and Dr. Mitchill states, that at Michilimackinac it has been known to attain the enormous size of one hundred and twenty pounds. Such a weight must, however, be very rare, for Carver, who passed a winter at Michilimackinac, does not appear to have met with any at all approaching to that magnitude. "One of my chief amusements," says he, "was that of fishing for trouts. Though the straits were covered with ice, we found means to make holes in it, and letting down strong lines, of fifteen yards in length, to which were fixed three or four hooks baited with small fish, we frequently caught two at a time, of *forty pounds* weight each, but the common size is from *ten to twenty* pounds." Particular lakes in the fur countries were mentioned to us as yielding trout of sixty or even ninety pounds, but none exceeding forty pounds came under our own observation\*. The *namaycush* is the tyrant of the lakes; no fish inhabiting the same waters can

\* According to La Hontan, "Les plus grosses Truites des lacs ont cinq pieds et demi de longueur et un pied de diametre; elles ont la chair rouge." (*Mém. de l'Amérique*, ii., p. 58.)

resist its voracity. The grey sucking-carp is most frequently found in its stomach; in the month of March, in lat. 64°, we saw that capacious receptacle crammed with the young of the *Iota maculosa*, and Mr. Todd says that the Herring salmon forms its principal food in Lake Huron.

The habitual residence of the namaycush is in the deepest parts of the lakes, but at certain seasons it resorts to the shallows to spawn. This movement occurs in Lake Huron about the 10th of October, and in the course of three weeks it retires again to the centre of the lake. During its stay in the narrow channels which separate the innumerable islands that skirt the northern borders of the lake, the Indians spear it in the night, by torch-light. In the fur countries it is taken occasionally in the autumn, in nets, and from March till May more abundantly by cod-hooks baited with sucking-carp, and set through holes in the ice in eight or nine fathoms water, but it is rarely seen in the summer or winter months, except when fished for at great depths. It resorts to the shallows in the spring, most probably in quest of food, as at that period many fish, upon which it preys, seek the borders of the lakes where the ice first breaks up, to feed upon the larvæ of insects which then swarm near the shore. The flesh of the namaycush is reddish or orange-coloured, being paler when out of season. When in good condition it yields much oil, and is very palling to the appetite if simply boiled, but roasting renders it a very pleasant article of diet. The Canadian voyageurs are fond of eating it raw, in a frozen state, after scorching it for a second or two over a quick fire, until the scales can be easily detached, but not continuing the application of the heat long enough to thaw the interior. The stomach when boiled is a favourite morsel with the same people.

The American trouts described in the preceding pages are, with the exception of *S. Scouleri*, similar to European species in the forms of the different bones of the face and gill-covers, but the namaycush exhibits much peculiarity in these respects, and its cranium is composed of much stronger and firmer bones than is usual in the genus. The coats of its stomach are remarkably thick, though they do not equal those of the *Coregonus albus*.

#### DESCRIPTION

Of specimen (Plate 79) taken in Lake Huron, October, 1824.

COLOUR.—The head, back, and sides have a dark greenish-grey colour, which, when examined closely, is resolved into small roundish yellowish-grey spots on a bluish-grey ground, which covers less space than the spots: the latter are most evident on the sides, where they are as big as duck-shot, each of them including three or four scales. The uncovered portion

of each scale is roundish, and its convex centre, having a greyish hue and silvery lustre, is surrounded by a dark border of minute dots which are deficient or less numerous on the yellowish-grey spots, and also on the bluish-white belly. The dorsal and caudal fins have the greenish-grey tint of the back, and the ventrals and anal are muddy-orange, this colour also partially tinging the pectorals. The irides are bright honey-yellow with blue clouds. The teeth, gums, and roof of the mouth have a tinge of purple, whence Dr. Mitchill gave the name of *amethystus* to the species.

SCALES moderately small, thin, flexible, obtusely oval, tiled, and firmly imbedded in the skin; the uncovered roundish part of each scale measures less than a line. The scales on the under surface of the tail, and adjoining part of the belly, are rather larger, and those on the lateral line, 133 in number, are mostly elliptical, being narrower and somewhat longer than the others. About 221 rows of scales meet at the lateral line, and a vertical row beneath the commencement of the dorsal contains 82, of which 32 are above the lateral line. There are thirteen scales in a linear inch measured on the sides, and a single detached scale measures about one line and three-quarters. The lateral line is about an inch nearer to the dorsal than to the upper ventral ray.

FORM much like that of the Common salmon: the profile of the head and body bulges a little, and the sides are somewhat flattened. The head forms one-fourth of the total length from the snout to the tips of the caudal: it is flattish above and slightly convex in profile. Radiating lines on the frontal bone appear through the dried skin, but the elevated central ridge and curved lateral uneven ones, conspicuous in several of the trouts already described, are nearly obsolete in this species. The skull is more bony than that of the Common salmon, and the snout, instead of being cartilaginous, is formed of firm bone. Eye midway between the tip of the snout and nape, and twice as near the former as to the hinder edge of the gill-cover, the measurement being made from the centre of the pupil. There are seven diameters and a half of the circular orbit in the total length of the head, and five and a half in that of its upper surface. The nostrils, consisting of two small contiguous orifices on each side, are situated before and a little above the angle of the orbit: the foremost orifices have a soft elevated edge, and are the largest.

The jaws are very strong. In the male the upper one overlaps the conical knob of the lower one by about half an inch: in the specimen now under consideration, which is supposed to be a female, the jaws are nearly equal, but the soft parts have been partly eaten by insects. The labials, not quite thrice the length of the intermaxillaries, are strong and nearly cylindrical (not a thin plate as in other trouts), and the appophysis, attached above like a crest, projects beyond the limb of the bone, in which respect also this trout differs from its congeners. The distance between the tip of the snout and lower extremity of the labial reaches from the snout to about an inch beyond the orbit, falling fully three-quarters of an inch short of the nape. The under jaw, thick and rounded, is articulated to the lower end of the preoperculum, and also by a hinge-like joint to the jugal-bone. The length of the lower jaw is equal to that of the upper surface of the head. The porous lines on the heads of other trouts exist likewise in this, being mostly connected with foramina in the bones.



**TEETH.**—The borders of the intermaxillaries, labials, lower jaws, and palate-bones are armed with very acute, slightly-curved, strong conical teeth: there is a circular cluster on the knob of the vomer, a double row extending at least half an inch backwards on that bone, and a row on each side of the tongue equally strong and more curved than the others: a deep furrow runs down the centre of the tongue between the rows of the teeth, and the soft parts form a smooth median ridge in the roof of the mouth, without any corresponding elevation of the bone. All the teeth are surrounded by soft gums, in which some small moveable teeth are implanted. The following is a scheme of the dentition in the individual under examination.

**TEETH.**—*Intermax.* 7—7; *Labials* 19—19; *Lower Jaw* 19—19; *Tongue* 8—8; *Vomer* 7—7\*; exclusive of the smaller teeth, which fall off with the soft parts.

**GILL-COVERS.**—*Preoperculum* moderately curved, nearly vertical. *Suboperculum* deeper than in the other trouts, articulated at its inner angle to the operculum and preoperculum by a slender process which is concealed by these bones: its edge forms fully one-half of the free border of the gill-cover and is finely grooved. The *gill-rays*, 12 in number, are flat, those nearest the gill-cover being the broadest: seven of them are inserted into the long appophysis of the hyoid bone, one or two into the intermediate cartilage, and the remainder into the posterior appophysis.

**FINS.**—*Br.* 11—12 †; *D.* 14—0; *P.* 14; *V.* 9; *A.* 11; *C.* 19‡.

The *dorsal* fin is situated in the middle of the fish, the exact middle between the end of the snout and tip of the central caudal ray, being opposite to the eighth dorsal ray and a little anterior to the ventrals: the height of the dorsal exceeds the length of its attachment: its fourth ray is the longest, the third is half as high, and is, together with the two very short anterior ones, closely applied to its base. The *adipose* fin is small and has a club-shaped profile. The *ventrals* contain nine rays each, the first being about twice as stout as the others. The *anal* contains eleven rays, the first of which is one-third shorter than the second and is closely applied to it: the last ray is two-thirds shorter than the second and is opposite to the adipose: the space between the anal and caudal measures more than the attachment of the former.

**INTESTINES.**—(Of a *male* killed in Winter Lake.) *Stomach* a large *sac* continuous with the *oesophagus* and not to be distinguished from it, bent upwards and bulging a little at the bend: its inner membrane is longitudinally plaited. *Cæca* numerous, their insertions occupying three inches and a half of the intestine. The internal coat of two inches of the lower part of the gut is disposed in circular *valvulae conniventes*. The *air-bladder* communicates with the *oesophagus* by a tube as big as a crow-quill. In a female specimen I found a number of long, slender, opake worms in the air-bladder, of a whitish colour, with a slightly-

\* The vomer is injured, so that the exact number of its teeth cannot be ascertained, but the above number still exists upon it.

† The specimen from which the figure was taken consists of the left side of the fish only, and shows twelve gill-rays; but as that side of the membrane generally has a ray more than the right side, I have marked it as above. I noted an individual which I examined at Winter Lake, lat. 64½° N., as having only eleven rays, not advertent to any difference between the two sides. Dr. Mitchill's scheme of the rays of his Lake Huron specimen is as follows:—

**FINS.**—*Br.* 13; *D.* 13—0; *V.* 9; *A.* 13; *C.* 19‡ or †.

curved stripe running along one side: they were pointed at both ends, the least acute being the end that moved most, and having apparently an orifice in its apex. The male namaycush measured thirty-five inches, including the caudal, and sixteen from the tip of the snout to the dorsal. The colours mentioned in the preceding description are those of this individual at the time of capture; the spots become more evident as the skin dries. The trout described by Dr. Mitchill was brought from Michillimackinac, and weighed thirty-two pounds and a half after the intestines were removed. It was fifty-four inches long, nine deep, and twenty-four in circumference.

## DIMENSIONS

Of the Lake Huron specimen described above.

		Inches.	Lines.			Inches.	Lines.
Length from tip of snout to tip of caudal		. 29	6	Length of labial		. 3	0
" " end of scales		. 26	0	" lower jaw		. 4	8
" " anus		. 19	0	" toothed edge of ditto		. 2	11
" " dorsal		. 13	6	" attachment of dorsal		. 3	0
" " edge of suboperculum		. 7	4	" its longest ray		. 3	9
" " nape		. 4	9	" its last ditto		. 1	2
" " tip of labials		. 3	10	" ventrals		. 3	6
" " basal end of snout		. 2	11	" attachment of anal		. 2	2
" " centre of pupil		. 2	6	" its longest ray		. 3	7
" " anterior edge of orbit		. 2	1	" its last ditto		. 1	0
" " centre of pupil to edge of gill-cover		. 5	0	" lobes of caudal		. 5	0
" " hind edge of orbit to ditto		. 4	2	" central rays of ditto		. 1	9
" " of transverse axis of orbit		. 0	11	Distance between anus and base of caudal		. 5	10
" " vertical ditto		. 0	10	Depth of caudal fork		. 2	2
" " intermaxillary		. 1	0				

[ 70. ] 10. SALMO MACKENZII. (Richardson.) *The Inconnu.*

INCONNU. MACKENZIE, *Voy. in N. Amer.*, p. 9, and elsewhere.  
SALMO MACKENZII. RICHARDSON, *Frank. Journ.*, p. 707, plate.

PLATE 84, one-third nat. size. f. a., nat. size.

This, according to Indian information, is an anadromous species, and is only known to exist in the Mackenzie and its tributaries, to which it can have access from the sea. It is never taken above the cascades of Slave River, in latitude 60° N.; but it forms an important article of food, at certain seasons, on Great Slave Lake and the Mackenzie. Its flesh is white, and when in good condition tolerably palatable, though rather soft and oily, and soon becoming disagreeable when used as daily food: it is firmest and best near the mouth of the Mackenzie, and when out of season is considered by the natives to be very unwholesome. The Incon-

nues usually taken in the nets vary in weight from five to fifteen pounds, but individuals are reported to have been caught of thirty or forty pounds.

The Inconnu differs from the typical trouts in its general aspect, and in the smallness of its teeth, which are crowded like velvet pile, and are altogether wanting on the labials: it seems to stand on the confines of the sub-genus, and to connect the *truttæ* with the *coregoni*. It disagrees with the latter in the number of its gill-rays, in having palatine and vomerine teeth, and in the form of the body.

#### DESCRIPTION

Of a specimen taken in Great Slave Lake in the spring of 1822.

COLOUR of the back and sides changing from bluish-grey to greenish-grey when moved in the light: of the belly bluish-white; the sides have a strong silvery hue. *Scales* sub-orbicular, four lines in diameter, and possessing much pearly lustre. *Lateral line* straight.

FORM.—*Body* roundish; in profile lanceolate. *Head* long and compressed with a flattened vertex. The sagittal line rises between the orbits into a smooth acute ridge. Orbits large, oval, situated as near again to the tip of the snout as to the edge of the gill-cover. The *sub-orbital* bones, apparently about six in number, form a circular plate mostly posterior to the eye; a narrow process runs under the eye to the anterior orbital, which is sub-orbicular and radiated on the surface. *Nostrils* close to the orbit: the anterior opening has a raised margin, and is contiguous to the posterior one. The *intermaxillaries*, forming about one-third of the border of the upper jaw, lie transversely, overlapping the curved articular ends of the labials, and giving a truncated form to the snout. The *labials*, thick and strong, have a lanceolate shape; they are articulated with the cartilaginous ends of the palate-bones through the medium of a small curved process. The *under jaw* is strong, and has broad, flat sides with an obtuse and slightly-knobbed extremity, which projects four or five lines beyond the upper jaw: its articulation being as far back as the posterior edge of the orbit, admits of considerable depression, but the opening of the mouth is not of corresponding magnitude, for it is contracted by a fold of integument which extends from the middle of the labial to the side of the lower jaw.

TEETH.—The intermaxillaries, extremity of the lower jaw, vomer, palate-bones, and tongue, are armed with narrow bands of teeth "*en velours*," as are also the root of the tongue and the superior and inferior pharyngeal bones.

GILL-COVERS.—The *operculum* and *suboperculum* form a very regular semicircle by the union of their posterior edges. The *preoperculum* is much curved, and includes a naked cheek, not wider than itself, between it and the sub-orbitals. The *gill-openings* are large: the membranes contain ten flat rays. The *branchial rakers* are rigid, awl-shaped, and rough interiorly, with minute teeth: those on the upper arch exceed half an inch in length, the others are smaller.

FINS.—*Br.* 10; *D.* 15—0; *P.* 17; *V.* 12; *A.* 18; *C.* 22½.

The *dorsal*, opposed to the ventrals, is about its length nearer to the caudal fin than to the

snout: it is obliquely quadrangular and higher than long: its three first rays are short and lie closely against the base of the fourth. The *anal* has a slightly-crescentic margin, and occupies more than half the space between its last ray and the caudal fin: its three anterior rays are minute. The *caudal* is large and forked.

INTESTINES.—The *œsophagus* and *stomach* three inches long, have nine internal longitudinal folds, and make a short turn upwards before terminating in the pylorus. A space of two inches between the pylorus and the insertion of the gall-duct is surrounded by crowded *cæca*; beneath the gall-duct the insertions of the *cæca* are confined to one side of the intestinal tube: the *cæca* are very numerous, slender, conical, and about a quarter of an inch long. The remainder of the intestine descends in a straight line to the anus: the *valvule conniventes* occupy an inch and a half of its lower end, a small piece next the anus being smooth\*. The *air-bladder* is large and communicates by a wide tube with the *œsophagus*. There is a large spleen attached to the curvature of the stomach.

DIMENSIONS.—The length from the tip of the snout to the end of the caudal is twenty inches and a half, or to the end of the scales on that fin, eighteen inches.

[71.] 1. SALMO (OSMERUS) EPERLANUS. (Artedi.) *The Smelt*.

FAMILY, Salmonoides. GENUS, Salmo. LINN. *Sub-genus*, Osmerus. ARTEDI.  
Osmerus radiis pinnæ ani septemdecem. ARTEDI, *Spec.*, p. 45. *Syn.*, p. 21.  
Salmo eperlanus. LINN. AUCTORUM. Spirling. SOOTIS.

According to Cuvier there is only one known species of this sub-genus, the highly-prized Smelt of the European seas and estuaries of the larger rivers. It exists as far north as Sweden, and is enumerated by Lawson and Catesby among the fish of America, but it does not occur in the *Fauna Grœnlandica*. M. Le Sueur has described a smelt taken between Newport and Boston, under the name of *Osmerus viridescens*; but as Cuvier, though well acquainted with that gentleman's ichthyological papers, has not noticed this smelt in the *Règne Animal*, we

\* The following dimensions of the intestines of two English female salmon, omitted to be inserted in a preceding page, may be contrasted with the above.

	No. 1.—63 cæca.		No. 2.—68 cæca.	
	Inches.	Lines.	Inches.	Lines.
Length from gullet to bend of stomach	10	6	10	0
„ bend to pylorus	3	10	3	9
„ pylorus to last cæcum	5	9	5	3
„ remainder of gut	17	0	16	10
„ of whole alimentary canal	37	1	35	10
„ space occupied by the thirty or forty <i>valvula conniventes</i>	9	0	0	0
„ longest cæcum	6	0	5	3

may infer that he did not consider its title to rank as a species sufficiently established. Lieutenant-Colonel Hamilton Smith has sent me a drawing of a smelt, which having been taken at Halifax, in Nova Scotia, is therefore likely to be the same with the New England one: this bears an almost exact resemblance to the European fish, except that the ventrals are farther back, commencing under the sixth ray of the dorsal. Steller and Mr. Collie mention the common smelt as frequenting Awatscha Bay.

The European Smelt has a row of small, short, closely-set teeth on the intermaxillaries and labials; somewhat longer and more remote ones on the lower jaw; and a row on both edges of the palate-bones, the teeth of the outer row being long and distant; there are four long teeth on the anterior end of the vomer, viz., two on each side continuous with the outer row of the palatine-teeth. The triangular tongue is armed with about ten strong teeth, two large ones being implanted in the apex, one before the other. The branchial arches are attached below to a narrow isthmus proceeding from the root of the tongue, and having two rows of minute teeth on its surface, but the upper pharyngeal bones are smooth. The slender rakers are rough with teeth internally, as in the trouts. The roof of the mouth and the head generally have some resemblance to the same parts of a pike, and the palate-bones have a similar membranous attachment to the vomer, admitting of lateral movement as in that fish. The under jaw is longer than the upper one, even when the mouth is closed. The gill-covers are those of a trout, the rays being however fewer. The first rays of the dorsal and ventrals are opposite to each other, and stand midway between the tip of the snout and termination of the scales on the caudal. The adipose fin is attached a little posterior to the middle of the anal, which is long. The tail is slender and the caudal fin forked with acute, widely-spreading lobes and a tapering base. The scales are large, thin, very deciduous, and brilliant, reflecting beautiful green tints on the upper part of the body; the sides and belly are silvery. The body is unspotted. The smell of the fish, when recently taken from the water, is like that of a cucumber.

FINS.—*Br.* 7—8; *P.* 14; *D.* 10—0; *V.* 8; *A.* 16\*; *C.* 19 $\frac{1}{2}$

\* Artedi reckons seventeen anal rays, and Lieutenant-Colonel Smith counted the same number in his Halifax smelt. In our specimen of the European fish, the last ray is divided to the base, so that there appear to be seventeen on a cursory examination.

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[72.] 1. SALMO (MALLOTUS) VILLOSUS. (Cuvier.) *The Capelin.*

FAMILY, Salmonoides. GENUS, Salmo. LINN. Sub-genus, Mallotus. CUVIER.  
 "Clupea villosa. MÜLL, *Prodr.*, p. 425."  
 Salmo arcticus. FABRICIUS, *Fauna Grœnl.*, p. 177. No. 128.  
 Capelan. PENN., *Arct. Zool.*, ii., p. 141. No. 175.  
 Salmo Grœnlandicus. BLOCH, t. 381. RICHARDSON, *Frank. Journ.*, p. 710.  
 Angmaggœnk. ESQUIMAUX. Angmagsak, Sennersulik (male). GREENLANDERS.

This sub-genus, like the preceding one, contains only a single ascertained species, which frequents the northern seas. It swarms on the coasts of Norway, Lapland, Iceland, Greenland, Newfoundland, the Welcome, Coronation Gulf, and, if the *Ouiki*, or *Salmo catervarius* of Steller be the same, it inhabits the Sea of Kamtschatka. It has not been mentioned by travellers as existing in the Icy Sea of Siberia, but is very probably an inhabitant of that sea also, thus completing the circuit of the arctic coasts. It approaches the shore in dense shoals in the spawning season, the females preceding the males. The latter, at this period, acquire elevated bands on the sides, composed of soft, tumid, elongated scales, by which it is said they adhere together, sometimes to the number of ten or more, and in this state they are occasionally driven on shore by the wind in immense quantities. Some males, named *sennersuitsut* by the Greenlanders, want the ridges of enlarged scales. April, May, June, and July are the months in which the Capelin approaches the Greenland coast. In the beginning of August we observed multitudes of the males congregated on some sandy shoals near the mouth of Back's River, which falls into Bathurst's Inlet. Many of them leaped into the canoes and furnished a very acceptable dish of fish for our table, much relished by the whole party. Mr. Anthony Parkhurst, who is said by Pennant to be the first author who has noticed this fish, in a letter to Hakluyt written in 1578, after indulging in some facetious remarks respecting his skill in charming it and the squid or cuttlefish to come ashore, observes, that the nature of the squid is to come by night as well as by day; but the other, which is like a smelt, and is called by the Spaniards *Anchovas*, and by the Portuguese *Capelinas*, "commeth also in the night, but chiefly in the day, being forced by the cod that would devour him, and therefore for feare comming so neare the shore, is driven drie by the surge of the sea on the pibble and sands. Of these being as good as a smelt you may take up with a shove-net as plentifully as you do wheate in a shovell, sufficient in three or four hours for a whole citie."

The *Malloti* are very nearly allied to the *Osmeri*, the principal difference being

in the smallness of their teeth. Their resemblance to each other in the form and structure of the head is very close: both have, when fresh, a strong smell of cucumbers, and both are said to emit, occasionally, a very noisome stench. Nilsson states that the stinking smelt, named *Nors* by the Swedes, is a smaller kind, but differing only in size from the larger, which is named *Slom*. The Capelin is much used in the Newfoundland fishery as a bait for cod, and it is also dried in large quantities and exported to London, where it is sold principally in the oyster shops. Dried capelin forms so important an article of food in Greenland, that it has been termed the daily bread of the natives.

Although authors have taken it for granted that there is but one species of Capelin, we do not know that the fact has been fully established by a comparison of specimens from different seas. The description quoted below from my notes, of the appearance of a recent individual taken in the American polar sea, differs from the Newfoundland fish (of which through the kindness of M. Audubon, I possess a number of specimens preserved in spirits) in the appearance of the scales on the back, and in the top of the head being granulated; but when I recollect the disadvantages under which that description was originally drawn up, I cannot venture to consider it as sufficient to warrant me in concluding that it relates to a new species.

#### DESCRIPTION

Of a *male* specimen taken in Bathurst Inlet, lat. 67° N., August 4, 1821.

**FORM.**—*Profile* of the body linear, the head forming a lanceolate termination on the one side, and the attachment of the anal fin sloping suddenly up towards the tail on the other. The back is broad. *Head.* The *eye* is large, and the centre of the pupil is eight lines distant from the obtuse extremity of the upper jaw. The under jaw, acute and longer than the upper one, is capable of considerable depression. When the mouth opens its sides are formed by the labials, whose posterior piece is very moveable, as in the *Coregoni*. The jaws, tongue, palate, and vomer, are furnished with minute *teeth*, which are more readily felt than seen. The *branchial arches* are set with a single row of bristle-like *rakers*, which appear to be smooth under the lens. The gill-openings are very large: the membranes contain nine rays.

**SCALES.**—Instead of scales of the ordinary form, the back is covered with small smooth grains like shagreen, but soft to the touch, which are continued along the upper surface of the head to the snout. A prominent obtuse ridge, of nearly equal breadth throughout, extends along the lateral line from the gill-opening to the caudal fin: it is composed of soft, tumid, semi-lanceolate, acute, diaphanous processes, or altered scales, minutely spotted with black and densely tiled, with the points turned towards the tail. There is a similar but less prominent ridge between the pectorals and ventrals, which re-commences behind the latter fins, and is continued, though less conspicuously, to the anal. These ridges cause the sides to appear

hollow as if pressed in. They are said by Cuvier to be peculiar to the male in the spawning season, and to be produced by a modification of the scales. The sides and belly are covered with delicate and very bright silvery scales, which are dotted on the margins with black specks: they are tiled and adhere firmly.

FINS.—*Br.* 9; *P.* 17; *D.* 14—0; *V.* 8; *A.* 22; *C.*

The *pectorals* are large, sub-orbicular, and placed near to each other. The *first dorsal* commences about midway between the occiput and caudal: it measures three-quarters of an inch in height, and contains fourteen rays, of which the two anterior ones are short, and the remainder forked at the tips: the connecting membrane is very thin and transparent. The *ventrals*, situated opposite to the dorsal, resemble the pectorals in size and form: they contain eight bifurcated rays, and measure, when expanded, an inch in diameter. The *anal* is supported throughout by rays of nearly equal length, but owing to the form of the part to which it is attached, its margin forms a convex curve: it contains twenty-two rays, the anterior being the strongest, and having the membrane scolloped between them, the posterior ones are delicate: its attachment exceeds an inch in length, being thrice as long as the space between it and the caudal. The *adipose fin* is five lines long and one line and a half high: it is situated a little anterior to the termination of the anal, and is composed of a thin membrane attached to a small ridge of the smooth tubercles that cover the back. The *caudal* is deeply forked.

COLOUR of the back and top of the head dull leek-green, with bright green and yellow reflexions when moved in the light. The sides and belly are silvery, minutely dotted with black. The gill-covers and jaws are mostly bluish-black with some bright silvery spots; the irides are silvery.

INTESTINES.—The *oesophagus* opens into a forked stomach, both parts of which point downwards; one is a blind sac, the other, of equal size, terminates in a delicate gut, which is continued in a straight line to the anus. Six *cæca* of unequal length surround the pylorus. The *faces* are of a honey-yellow colour. The *melt* of the specimen was large and mature.

## DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length excluding the caudal . . . . .	6	0	Length of attachment of anal . . . . .	1	1
„ from tip of snout to anus . . . . .	4	6	„ „ adipose . . . . .	0	5
„ of longest dorsal rays . . . . .	0	9	Height of adipose . . . . .	0	1½
„ pectorals . . . . .	1	2			

In my Newfoundland specimens, which are all males, the teeth are small and acute, set in a single series on the intermaxillaries, labials, lower jaw, across the front of the vomer, and on the anterior part of the outer edge of the palate-bones and posterior part of their inner edge. The *tongue* has a flat oval surface, which is surrounded by about twenty teeth, there are two or three minute ones scattered over the central space, and two rows exist on the isthmus which supports the branchial arches, as in the smelts. A small median ridge extends the whole length of the upper part of the head; the lateral ridges, more prominent, rise into even, acute-edged, bony crests over the orbits. The back is covered with small, round, thin, flat scales, of a different colour from those on the lower part of the body, and having



no lustre. Were these scales to become tumid they would assume the granulated appearance noticed in the account of the Bathurst Inlet fish. The top of the head is covered with smooth skin on which there are many black specks. The pectorals almost touch below, and include an acutely elliptical space between their origins and the gill-openings. The anal is attached to a compressed, acute, and somewhat projecting portion of the tail. In other respects the description of the Bathurst Inlet fish applies exactly to those from Newfoundland. The rays vary in different specimens, as may be observed in the following table.

FINS.— <i>Br.</i> 9—10; <i>D.</i> 14—0; <i>P.</i> 20; <i>V.</i> 8; <i>A.</i> 23; <i>C.</i> 19½. No. 1.						
9—9;	14—0;	20;	8;	21;	19½.	2.
9—9;	13—0;	19;	8;	21;	19½.	3.
9—9;	14—0;	18;	8;	23;	19½.	4.
9—9;	13—0;	20;	9;	21;	19½.	5.
9—8;	13—0;	19;	8;	22;	19½.	6.
8—8;	13—0;	18;	8;	23;	19½.	7.

In all, the last ray of the dorsal is divided to the base, and that of the anal nearly so. The caudal is much forked.

## DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from tip of snout to tip of caudal . . . . .	6	9	Length of pectorals . . . . .	0	10
" " tip of central caudal ray . . . . .	6	4½	" ventrals . . . . .	0	9½
" " end of scales . . . . .	6	1½	" attachment of dorsal . . . . .	0	8½
" " anus . . . . .	4	2½	" its longest ray . . . . .	0	9
" " dorsal . . . . .	3	3	" attachment of adipose . . . . .	0	5½
" " ventrals . . . . .	3	2	" its height . . . . .	0	2
" " edge of gill-cover . . . . .	1	3½	" attachment of anal . . . . .	1	2½
" " nape . . . . .	0	11	" its longest ray . . . . .	0	6
" " tip of labials . . . . .	0	7	" lobe of caudal . . . . .	1	1
" " centre of pupil . . . . .	0	7½	" its longest ray . . . . .	0	9½
" of intermaxillaries . . . . .	0	2½	" its shortest ditto . . . . .	0	4½
" labials . . . . .	0	5½	Depth of caudal fork . . . . .	0	4½
" under jaw . . . . .	0	8½			

[73.] I. SALMO (THYMALLUS) SIGNIFER. (Richardson.) *Back's Grayling.*

FAMILY, Salmonoides. GENUS, Salmo. LINN. *Sub-genus*, Thymallus. CUVIER.  
 Coregonus signifera. RICH., *Fr. Journ.*, pl. 26, p. 711. CUVIER, *Rég. An.* (*sub. Thymallo.*)  
 Hewlook-powak. ESQUIMAUX. Poisson bleu. CANADIAN VOYAGERS.

## PLATE 88.

This very beautiful fish abounds in the rocky streams that flow through the primitive country lying north of the 62nd parallel of latitude, between Mackenzie's

River and the Welcome. Its highly-appropriate Esquimaux name, denoting "wing-like fin," alludes to its magnificent dorsal, and it was in reference to the same feature that I bestowed upon it the specific appellation of *Signifer*, or the "standard-bearer," intending also to advert to the rank of my companion, Captain Back, then a midshipman, who took the first specimen that we saw with the artificial fly. It is found only in clear waters, and seems to delight in the most rapid parts of the mountain streams. In the autumn of 1820 we obtained many by angling in a rapid of Winter River, opposite to Fort Enterprise. The sport was excellent, for this grayling generally springs entirely out of the water when first struck with the hook, and tugs strongly at the line, requiring as much dexterity to land it safely as would secure a trout of six times the size. The stomachs of the individuals that we then took were filled with a black earthy-looking matter, mixed with what appeared, on a cursory examination, to be gravel, but which was perhaps, in reality, fragments of the shells that abound in the waters it inhabits. The roes of individuals caught towards the end of August were considerably developed, but neither the spawning places, nor the precise period of spawning, were ascertained by us. The Indians say that it spawns in the spring, and that its winter residence is in the lakes.

The characters by which the Graylings are distinguished from the trouts in the *Règne Animal*, are the smallness of the mouth, the fineness of the teeth, the great size of the dorsal fin, and the largeness of the scales. The stomach is a very thick sac, the gill-rays are seven or eight in number.

The plate which is given of Back's Grayling in the narrative of Sir John Franklin's First Journey, was executed from an individual taken in Winter Lake, and carefully skinned and dried. I much regret that that specimen having gone to decay, I cannot compare it with the one brought by the last expedition from Great Bear Lake, of which the figure in the present work is an exact representation, drawn on a scale of half the natural size. The two figures differ in the relative size of the head, depth of the body, and some other particulars. The dorsal fin in the first plate is incorrect, not from any fault of the skilful artist who drew it, but owing to a part of the fin, which was broken off in the carriage, having been supplied by guess. The individuals taken in Great Bear Lake were much duller in their tints of colour than those we obtained in Winter River, probably because the latter being nearly in a spawning condition, were more brilliant than at other seasons.

## DESCRIPTION

Of a specimen from Great Bear Lake, latitude 65° N.

**COLOUR.**—*Back* dark; *sides* of a hue intermediate between lavender-purple and bluish-grey; *belly* blackish-grey with several irregular whitish blotches. There are five or six quadrangular spots of Prussian-blue on the anterior part of the body, each tingeing the margin of four adjoining scales. The *head* is hair-brown above, the cheeks and gill-covers the same, combined with purplish tints, and there is a blue mark on each side of the lower jaw. The *dorsal fin* has a blackish-grey colour, with some lighter blotches, and is crossed by rows of beautiful Berlin-blue spots; it is edged with light lake-red. The *ventrals* are streaked with reddish and whitish lines in the direction of their rays.

**SCALES** covered with a thickish epidermis and consequently having little lustre; they are semi-oval, their exterior edges being a segment of a circle, and appearing under a lens finely but irregularly toothed or serrated: their bases are truncated, and show three lobes or teeth corresponding with four deep grooves that converge in the middle of the scale: the fine concentric lines of structure are waved. The scales are smaller on the forepart of the back and belly: on the sides they measure four lines transversely, and rather less from their exterior edge to the base. There are 87 on the lateral line, including three or four small ones on the base of the caudal, and 27 in a vertical row anterior to the ventrals, of which nine are above the lateral line. The scales do not end on the caudal as in the trouts, lavarets, &c., but extend farthest on the lobes, having the same forked termination with the fin itself. In this respect, and in the roughness of the scales, the Graylings have an analogy with the *Percoidæ* and other rough-scaled fishes. The *lateral line* is straight, and the scales composing it, though of equal size with the others, show only half as much surface when in their place.

**FORM.**—Body compressed with an elliptical profile, the head, when the mouth is shut, ending acutely, but when viewed from above, or in front, the snout is obtuse. The greatest depth of the body is scarcely one-fifth of the total length, caudal included. *Head* small, being one-sixth of the total length, excluding the caudal, or one-seventh including it. In the dried specimen there is a slightly-elevated sagittal ridge, the occiput is radiated, and the tubular lateral ridges extend conspicuously from the nostrils to the upper angle of the gill-cover. A line of tubes also passes along the middle of the infra-orbital bones, another down the upper limb of the preoperculum, and there are three diverging tubes on the lower limb of that bone. *Orbit* large, distant half its own diameter from the tip of the snout, and two diameters from the edge of the gill-cover. *Nostrils* midway between the orbit and tip of the snout. The *infra-orbital bones* consist of four distinct radiated ones behind the eye, a narrow tubular ridge beneath the orbit, and a small thick plate with diverging tubular lines before the eye. *Mouth* not cloven as far back as the edge of the orbit. *Intermaxillaries* narrower and longer than in the *coregoni*, but overlapping the articular ends of the labials less than in the *truttæ*. *Labials* thin elliptical plates, the posterior piece lanceolate and as broad as the anterior one. *Under jaw* tolerably strong and rounded at the tip, which, when depressed, projects about four lines beyond the snout.

**TEETH** small, subulate, pointed, and slightly curved, standing in a single crowded series on the intermaxillaries, labials, and under jaw; in two rows on the acutely projecting edge of the palate-bones; and in a cluster of six or seven on the anterior extremity of the vomer; the latter bone is flat and smooth posteriorly. The *tongue* is also smooth, but the pharyngeal bones and the cartilaginous *rakers* of the upper branchial arch are rough: the rakers of the other arches are smaller and softer.

**GILL-COVERS.**—*Preoperculum* having the form of a moderately-curved and rather wide crescent. *Suboperculum* more than half the height of the operculum, and not exceeding it in length. *Interoperculum* small and acute-angled. Eight *gill-rays* on the left side and nine on the right.

**FINS.**—*Br.* 9—8; *D.* 23—0; *P.* 15; *V.* 9; *A.* 13; *C.* 19½.

The *dorsal* contains 23 rays, which increase in succession from the first minute one: the three last and longest ones exceed in height the greatest depth of the body: the commencement of the dorsal is far forwards, or about half way between the gill-openings and ventrals, and its attachment is equal to the distance between its first ray and the centre of the eye, or between its last ray and the adipose fin. The *adipose* fin is partly behind the anal. The *ventrals* originate a little anterior to the middle between the snout and the base of the caudal, or under the eighteenth dorsal ray. Their *scale-like appendages* are long, thin, and pointed. *Anal* rather small and rounded anteriorly. *Caudal* deeply forked.

**INTESTINES.**—The alimentary canal, having its lining disposed in five large longitudinal folds, descends from the gullet for two inches and a half, when it dilates considerably, bends upwards upon itself, and terminates in a narrow pylorus: the dilated part resembles the stomach of the *coregonus albus*, or attihawmeg, in its structure, but its coats are thinner. The intestine, having very thin coats, runs in a straight line from the pylorus to the anus, being exactly equal to the abdominal cavity in length. It gives origin, within three-quarters of an inch of the pylorus, to eighteen cæca, and between two and three inches of its inferior part are furnished with internal circular folds, or *valvulae conniventes*. The *liver* is small, without lobes, and there is a large *spleen* attached to the curvature of the stomach. The *air-bladder* is large and communicates with the œsophagus. The *fæces* were black.

On comparing the American specimen with a fine English grayling, for which I am indebted to Mr. Yarrell, the following were the most obvious differences. The English fish is much lighter in colour, with more lustre, and exhibits about sixteen faint longitudinal bands passing through the centres of the same number of rows of scales. Its body is thicker, its head larger, and the distance between the orbit and end of the snout measures double to what it does in Back's grayling. The tubular ridges on its head are less conspicuous, and its mouth is wider; but its under jaw does not project so far as in the latter. It also presents a remarkable difference in the want of palatine-teeth, these bones being quite smooth and rounded on the edge. The teeth on the mandibles are smaller than in the American grayling, and those on the vomer are perceptible only by the aid of a lens. Both have teeth on the pharyngeal bones and rakers. There are 81 scales on the lateral line of the English

grayling, the scales are more nearly smooth on the edge than in the American fish, and the teeth of their bases are smaller and more numerous, being four or more.

## DIMENSIONS.

	Back's Grayling.		English Grayling.	
	In.	lin.	In.	lin.
Length from tip of snout * to tip of caudal . . . . .	17	6	17	6
"    "    end of caudal rays of ditto . . . . .	16	6	16	3
"    "    end of scales on central rays . . . . .	15	6	15	6
"    "    anus . . . . .	11	0	11	3
"    "    ventrals . . . . .	7	3½	7	6
"    "    dorsal . . . . .	4	11	5	5
"    "    edge of gill-cover . . . . .	2	5	2	9
"    "    nape . . . . .	1	10	2	2
"    "    edge of orbit . . . . .	0	4½	0	8
"    "    nostrils . . . . .	0	3	0	7
Breadth between articulations of labials . . . . .	0	8½	0	8
of occiput . . . . .	1	2	1	2
Length of labials . . . . .	0	8¾	0	9¾
lower jaw . . . . .	2	4	2	4
attachment of dorsal . . . . .	3	11	3	11
its penultimate or longest ray . . . . .	4	0	2	4
adipose fin . . . . .	0	9½	0	8
pectorals . . . . .	2	6	2	3
ventrals . . . . .	2	2	2	3
ventral appendages . . . . .	0	7	0	7
attachment of anal . . . . .	1	4	1	5
its longest rays . . . . .	1	8	1	8
lobes of caudal . . . . .	2	8½	2	7
its central rays beyond the scales . . . . .	1	0	0	9
Depth of caudal fork . . . . .	0	10	1	2

[74.] 2. SALMO (THYMALLUS) THYMALLOIDES. (Richardson.) *Lesser Grayling.*

*Coregonus thymalloides* †. RICHARDSON, *Frankl. Journ.*, p. 714.

A much smaller grayling was taken in Winter River along with Back's grayling, from which it differed in its tints of colour, brighter scales, and in the shape and size of its dorsal fin. At the time, I thought these variations sufficient to characterise it as a distinct species, but having since ascertained that the dorsal fin varies greatly in size, and even in shape, in the European graylings of different

\* Or articulation of labials, and not including the intermaxillaries, which project beyond the snout when the mouth opens.

† *Thymalloides* is objectionable as a specific name in the sub-genus *Thymallus*, but I did not consider necessary to alter it, as the species is a doubtful one.

ages, I think it probable that it may have been the young of the *Thymallus signifer*. The subjoined imperfect description is all that I have to guide me in forming a judgment on this matter now, as I neglected to prepare a specimen in the autumn, when this small fish was plentiful, and none were seen in the spring. The Lesser grayling rises eagerly at the artificial fly. The stomachs of those which we opened were filled with sand and black earth.

## DESCRIPTION

Of a recent specimen taken in Winter River, August, 1820.

FORM.—*Body* compressed with a lanceolate profile, belly rather broader than the back. The *dorsal fin* has, like Back's grayling, from twenty to twenty-four rays, but the posterior ones do not branch out so much, and scarcely exceed the others in height; the three first rays only being shorter: the height of the fin is one inch. *Ventrals* situated under the middle of the dorsal.

COLOUR.—*Sides* bluish-grey with purplish reflections, belly white. The *scales* have a bright pearly lustre. The *head* is hair-brown, and the gill-covers exhibit some purplish tints. *Dorsal fin* dark bluish grey, with several rows of purplish spots bordered by lighter red. *Ventrals* streaked with opake white.

FINS.—*Br.* 8; *D.* 23—0; *P.* 17; *V.* 9; *A.* 10; *C.* 19½.

LENGTH, excluding the caudal, eight inches and a half. Distance between the tip of the snout and anus six inches.

[75.] 1. SALMO (COREGONUS) ALBUS. *The Attihawmeg.*

FAMILY, Salmonoides. GENUS, Salmo. LINN. *Sub-genus*, Coregonus. CUV.

*Salmo lavaretus* (*Guiniad* and *Tichomeg*). PENN., *Arct. Zool. Intr.*, p. 298,  
and ii., p. 293, excluding synonymes.

*Coregonus albus*. LE SUEUR, *Journ. Ac. Sc. Phil.*, i., p. 232. CUV., *Rég. An.*, ii., p. 308.

White fish. FUR TRADERS. POISSON blanc. CANADIANS.

Attihawmegh. CREE INDIANS.

PLATE 89, f. 2, A and B, half nat. size.

Several species of this sub-genus have been celebrated for the delicacy of their flavour, but none have been more justly so than the *Attihawmeg*, which is an inhabitant of all the interior lakes of America, from Erie to the Arctic Sea. Several Indian hordes mainly subsist upon it, and it forms the principal food at many of the fur posts, for eight or nine months of the year,—the supply of other articles of diet being scanty and casual. Though it is a rich, fat fish, instead of producing satiety it becomes daily more agreeable to the palate; and I know, from experience,

that though deprived of bread and vegetables, one may live wholly upon this fish for months, or even years, without tiring. Its good qualities were known as early as the time of La Hontan, who says, "*Les poissons des Lacs sont meilleures que ceux de la mer et des rivières, surtout les Poissons blancs ; qui surpassent toutes les autres espèces en bonté et en délicatesse.*" The colour of its flesh is bluish-white at all seasons, changing to a pure opaque white when boiled, whence its appellation of "white-fish," for though there are many other white-fleshed fish in the northern waters of America, this is by far the most important one.

In certain lakes, and in some seasons, the Attihawmeg is loaded with fat, particularly about the shoulders, where it produces a hump. After the spawning season its flesh becomes lean and rather watery, but not unwholesome, and it may be improved by suspension in the open air for a month or six weeks. Though the coolness of the weather, at that time of the year, prevents putrefaction from proceeding far, the fish acquires a strong taint, while it becomes richer, firmer, and altogether more agreeable to the palates of the ichthyophagists of the fur countries than when fresh. The mode of cooking the Attihawmeg is generally by boiling. After the fish is cleaned, and the scales scraped off, it is cut into several pieces, which are put into a thin copper kettle, with water enough to cover them, and placed over a slow fire. As soon as the water is on the point of boiling, the kettle is taken off, shook by a semicircular motion of the hand backwards and forwards, and replaced on the fire for a short time. If the shaking be not attended to exactly at the proper moment, or be unskilfully performed, the fish coagulating too suddenly becomes comparatively dry to the taste, and the soup is poor. The stomach, when cleaned and boiled with the rest of the fish, is a favourite morsel with the voyageurs.

The Attihawmeg does not exist in the St. Lawrence below the falls of Niagara, and, according to Mr. Hutchins, it is never seen in the tidal waters of Hudson's Bay \* ; but it is common enough, and of fine quality, in the mouths of the Mackenzie, Coppermine, and other rivers that fall into the Arctic Sea. We did not actually take any in the salt water, but it most probably can live indifferently in fresh or salt water, like several species of *trutta*, and *coregoni* that occasionally wander to the sea, though they are not strictly anadromous. Many lakes, either absolutely land-locked, or cut off from the sea by lofty cascades which fish cannot surmount, contain fine Attihawmeg, together with the Round-fish, an allied species to be afterwards described, which we also found in the Arctic Sea. In

\* The "Titymeg as big as a Herring," mentioned in the narrative of the Voyage of the Dobbe and California as abounding in Hayes and Nelson rivers, within reach of the tidal waters of Hudson's Bay, is, I believe, of a different species, named by Mr. Hutchins *Wisepeg-attihawmeg*, and by Pennant *Sea-guiniad*.

October the Attihawmeg quits the lakes and enters the rivers, for the purpose of depositing its spawn. It ascends the stream in the night-time, and returns to the lake as soon as it has spawned. Dr. Todd informed me that it enters Severn River from Lake Huron about the 25th of October, and retires to the depths of the lake again by the 10th of November; but that in some rapid rocky rivers of that lake individuals are taken throughout the year. A few spawn in the summer. It is a gregarious fish, and resorts to different parts of a lake according to the season of the year, its movements being in all probability regulated by its supply of food. In winter the fisheries are generally established in deep water, remote from the shore; towards the breaking up of the ice they are moved near to the outlets of the lake, and in the summer comparatively few Attihawmeg are caught, except what are speared in the rivers. After the spawning period the fall-fishery, as it is termed, is more productive in shallow bays and on banks near the shore. I was informed, in the fur countries, that this fish preys on insects, and that it occasionally, though rarely, takes a hook baited with a small piece of meat. The stomachs of some taken in Pine Island Lake, under the ice, contained a dark-coloured earth mixed with the slender fibrils of vegetable roots, and a few soft insects or larvæ like white worms. Dr. Todd found fresh-water shells and small fishes in the stomachs of the Lake Huron Attihawmeg; indeed, shelly mollusca (*Helix*, *Planorbis*, *Lymneus*, *Pakudina*, &c.) appear to be a favourite food of several trout and coregoni, both in Europe and America. The Attihawmeg has some resemblance to the herring in the structure of its jaws and gill-covers, and, like that fish, it dies speedily when taken out of the water. The usual weight of the Attihawmeg is from two to three pounds, and, when very fat, it attains to seven or eight pounds; but these large fish are confined to particular localities. In certain lakes it reaches a much greater size, having been taken in Lake Huron of the weight of thirteen pounds, and in Manito Lake, it is said, of twenty pounds. The largest seen by Mr. Hutchins, in the vicinity of Hudson's Bay, weighed between four and five pounds, measured twenty inches in length, and four in depth. One of seven pounds weight, caught in Lake Huron, was twenty-seven inches long.

The Attihawmeg is taken in the winter time in gill-nets set under the ice. Each net is fifty or sixty fathoms long, and of a depth proportionate to that of the water, and in setting it for the first time a series of holes are made through the ice, at such a distance apart, that a long stick can be readily passed in the water from one to the other: a line, rather longer than the net to which it is fastened, being attached to the stick, is carried along and brought out at the extreme hole. The net being



buoyed up above by thin oblong pieces of fir, and loaded below with stones, is drawn beneath the ice by means of the line, and firmly fixed at each end to stakes thrust through the holes. After the first time the intermediate holes in the ice, being useless, are allowed to freeze up, but the extreme ones are opened daily, and the net examined by the fisherman, who draws it out at one hole, while his assistant veers away the line at the other. A careful fisherman changes the net every second or third day, for the purpose of drying and repairing it. Occasionally two or more nets are attached to each other, and set in the same way as a single one. As the ice in the fur countries varies from three to six feet in thickness, the labour of setting a net is considerable, and when the cold is severe, even the re-opening of the holes occupies much time. Most of the fish enter the net by night. They freeze as they are taken from the water, and are thus preserved in a perfectly sound state until spring; but the newly-taken fish are superior in flavour to European palates. The Copper Indians strike the fish through holes cut in the ice, using a very ingenious fish-gig, constructed of rein-deer horns, on the same principle, but superior in its effect, to the "stong" with which eels are commonly taken in Lincolnshire.

The Attihawmeg differs from the other known coregoni in the extraordinary thickness of its stomach, which resembles the gizzard of a fowl. Baron Cuvier having examined my Lake Huron specimens, returned them ticketed, "*Coregone voisin de le Palée de Lac de Geneve.*" The sub-genus *Coregonus* is characterised in the *Règne Animal* as having a mouth like the Graylings, but less perfectly armed, being often entirely destitute of teeth. The scales are large and the dorsal is not so long as it is high anteriorly. The *C. oxyrinchus* is distinguished from other European species by a soft prominence on the tip of its snout, and the *C. marcenula* by the lower jaw projecting beyond the upper one, agreeing in that character with the *Salmo clupeoides* of Pallas: the rest have the snout blunt as if truncated, like that of the Attihawmeg and most of the American coregoni.

## DESCRIPTION

Of a specimen taken in Lake Huron.

FORM.—*Profile* ovate, more or less gibbous before the dorsal fin, with a slightly-tapering tail inclining a little upwards. The greatest *depth* of a well-grown Attihawmeg is between a third and a fourth of its length, excluding the caudal, but when very fat the depth is greater \*. The *body* is compressed, the transverse diameter being considerably less than the vertical one.

\* In an Attihawmeg of the ordinary size, taken in Pine Island Lake, the depth of the body was to the length of the fish, exclusive of the caudal, as five to seventeen.

*Head* narrow below, with a moderately wide frontal bone, and forming one-fifth of the length; excluding the caudal. The upper surface of the head is smooth and even, in the recent fish, but in drying, the straight, lateral, tubular ridges become visible, traversing a depression over each orbit: the saggital crest is scarcely perceptible, even in the naked skull, and it is cut short anteriorly by a groove which is widest at its termination between the nostrils. The *eyes* are large, and situated a little more than a diameter of the orbit from the tip of the snout, and near thrice as far from the edge of the gill-plate. The *infra-orbital* bones cover more than two-thirds of the cheek: they are traversed by a tubular ridge with short lateral branches. The *nostrils* are placed midway between the tip of the snout and the orbit. The *snout* is blunt when seen in front, but its profile is more acute: it projects a little beyond the shut mouth, but when the jaws are separated the intermaxillaries descend from it perpendicularly, the tip of the lower jaw being then in the same line also. The *mouth* has a small orifice, and when shut its angles are depressed. The *intermaxillaries* are higher than they are long, or they measure more vertically than they do transversely, so that the orifice of the mouth is farther beneath the snout than in the succeeding species. The *labials* thin, broad and pyriform, are articulated by their narrow end to the palatine-bones, in contact with the ball and socket joint of the intermaxillaries: the posterior piece, or appophysis, is as broad as the anterior one and about two-thirds as long. The limb of the *under jaw* expands into a thin plate, which glides under the anterior sub-orbital when the mouth closes.

**TEETH.**—The jaws and tongue are furnished with a few teeth, which are too minute to be readily seen by the naked eye, and too slender to be very perceptible to the finger. The palate and vomer are quite smooth.

**GILL-COVERS.**—The *preoperculum* is sharply curved and rather broad, its width in the middle equalling the height of the suboperculum. A tubular ridge runs along the anterior edge of its upper limb, and separates on the lower one into four diverging branches. The other bones of the gill-cover are thin and smooth. The *operculum* measures one-third more vertically than it does horizontally; while, on the contrary, the *suboperculum* is twice as long as it is high. The *interoperculum* is triangular. The *gill-membrane* is rendered thick by the quantity of muscle and a shining membrane which line its eight thin, flat, curved rays. The *branchial arches* have each a single row of erect, subulate rakers, a quarter of an inch long, and rough on their inner surfaces. The *pharyngeal bones* are inconspicuous and toothless.

**SCALES** rather smaller on the fore part of the belly and back than elsewhere: they are irregularly orbicular on the sides, and about half an inch in diameter. They have a bright pearly lustre, and are thin and very deciduous. The lateral line contains 80 scales, including those on the base of the caudal, and there are 24 in a vertical line before the dorsal, of which 10 are above the lateral line, and as many between it and the upper ray of the ventrals. The scales on the lateral line are somewhat smaller, and differ a little in form from the adjoining rows. *Lateral line* slightly arched in its course along the body, but after passing the anus running horizontally through the tail.

**COLOUR**, in the shade, bluish-grey on the back, lighter on the sides, and white on the belly,

giving place to a nacry and iridescent pearly lustre in a full light. Cheeks, opercula, and irides thickly covered with nacre.

FINS.—*Br.* 8; *D.* 15—0; *P.* 16; *V.* 11; *A.* 15; *C.* 19½.

The fifth and sixth rays of the *dorsal* are the longest, and the three first are closely applied to the base of the fourth. The middle between the tip of the snout and base of the caudal fin, is opposite to the ninth or tenth dorsal rays, and posterior to the attachment of the *ventrals*. The *adipose fin* is rather large, and is situated opposite to the termination of the anal: it contains no rays whatever, and is not supported by interspinous bones: its base is clothed with small scales. The *ventrals* contain eleven rather stout rays. The *anal*, shaped like the dorsal, contains fifteen rays, of which the three first are applied to the base of the fourth, and the last one is divided to its origin. The anal occupies a little more than half the space between the anus and caudal. The *caudal* is forked and spreads widely. The scales terminate upon it by the same outline as in the trouts, being three sides of a rectangle\*.

#### DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from tip of snout to tips of caudal	. 19	3	Length of lower jaw	. 1	3
„ „ end of central rays	. 18	3	„ attachment of dorsal	. 2	3
„ „ anus	. 12	6	„ its longest rays	. 2	7
„ „ ventrals	. 8	3	„ its last ditto	. 0	9
„ „ dorsal	. 8	0	„ adipose fin	. 0	9
„ „ edge of gill-cover	. 3	8	„ pectorals	. 2	9
„ „ nape	. 2	3½	„ ventrals	. 2	10
„ „ orbit	. 0	10½	„ attachment of anal	. 2	0
„ „ nostrils	. 0	4½	„ its longest ray	. 2	4
„ of lateral line to end of scales on			„ its last ditto	. 0	7½
caudal	. 13	9	„ lobes of caudal	. 3	8
„ intermaxillaries, vertically	. 0	4½	„ its central rays	. 1	3
„ labials	. 0	11	Depth of caudal fork	. 1	0

#### INTESTINES

Described from a specimen taken in Pine Island Lake, in lat. 54° N., in the winter of 1819–20.

On opening the abdomen a multitude of *cæca* present themselves, involved in the folds of a membrane which is a production of the peritonæum, bearing a strong resemblance to the omentum of quadrupeds, and, like it, most commonly loaded with fat: it descends about half way down the belly, concealing the stomach and liver, and is closely connected with the former viscus by numerous vessels. A narrow *spleen* is attached to its right border. The *alimentary canal* descends from the gullet in form of a wide tube five inches long, having its lining disposed in six longitudinal folds. An inch of the upper part of the lining has a red colour and glandular structure, and may be considered as belonging to the *œsophagus*. The remainder of the tube may be termed the *upper stomach*: it crosses the liver by a sudden turn, and bending upwards terminates in an oviform bag two inches and a half long, which may be denominated the *proper stomach*. It has, from the thickness of its substance, a strong resemblance to

\* The engraver has not represented this happily in any of our plates of coregoni; but the form that is meant may be seen by turning to plate 84, or any of the other trouts.

the gizzard of a fowl, and consists of a thin peritonæal coat; a thick firm semi-transparent one, which, when boiled, separates into layers; a thinner, but firmer and almost cartilaginous one; and, lastly, an inner membrane of a grey colour and spongy substance, differing materially, in appearance, from the lining of the upper stomach: its folds are nearly obsolete. The *pylorus* is in the fundus of the stomach, which touches the upper extremity of the abdomen. From this a slender *intestine*, with thin coats and a few internal longitudinal folds, descends to the anus. It is encircled, at its commencement, by clustered *cæca*, which continue to be inserted, on one side, for two-thirds of its length. There are in all about one hundred and fifty of them, an inch long, of a conical form, and filled with a yellowish mucus. The lower part of the intestine is furnished internally with circular folds, or *valvula conniventes*, but a small portion next the anus is smooth. The *liver* is small, obtusely triangular, and without lobes; it lies anterior to the œsophagus, and posterior to the *cæca* and intestine. The *gall-duct*, which has remarkably thick coats, terminates in the intestine about half an inch below the pylorus. The *air-bladder* extends the whole length of the abdomen, and is connected with the upper part of the stomach by a pretty wide tube.

## DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length of alimentary canal from gullet to			Length of whole alimentary canal from gullet		
lower stomach . . . . .	5	0	to anus . . . . .	19	6
" lower stomach . . . . .	2	6	" fish from snout to base of central		
" upper intestine with smooth lining	9	0	caudal rays . . . . .	16	0
" lower ditto with circular rugæ . . . . .	3	0			

[76.] 2. SALMO (COREGONUS) TULLIBEE. (Richardson.) *The Tullibee.*

Ottowneebee. CREE INDIANS. Tullibee. FUR TRADERS.

This fish is very generally diffused through the waters of the fur countries, but nowhere is it taken in such numbers as the Attihawmeg. The fishermen know it at once, but as I was a novice in ichthyological pursuits when the recent fish were before me, I failed in detecting discriminating external characters, and my prepared specimens having gone to decay, the deficiency cannot now be supplied. In the appendix to the narrative of Sir John Franklin's First Journey, I referred the Tullibee doubtfully to the *Coregonus Artedi* of Le Sueur; but on re-considering the description of that fish, it appears to be decidedly unlike the former in its pointed snout and round scales. The Tullibee differs from the Attihawmeg in having a much thinner stomach and a smaller number of *cæca*, yet its food and general habits are the same with those of that fish. It is much inferior as an

article of food, being generally lean and watery, though it is wholesome and destitute of any disagreeable flavour.

## DESCRIPTION \*

Drawn up from an examination of recent male specimens in the winter of 1819-20 at Cumberland-House, Pine Island Lake, lat. 54° N.

**COLOUR.**—In the shade, the *back* is greenish-grey, the *belly* white, and the sides of an intermediate hue; but when opposed to the light, the whole body is silvery, with much lustre. The top of the head is covered with smooth bluish-grey skin. **SCALES** oblong, half an inch long, and of nearly uniform size.

**FORM** much compressed, the belly rounded, the back rather more acute. The *profile* is broadly oblong, tapering suddenly at the anal; the head conical. *Eyes* large, and rather more than their own diameter from the end of the snout. The orifice of the mouth is transverse and rather small, and when the jaws are open the *snout* appears truncated. The *intermaxillaries* are small and cartilaginous; the *labials* oblong, and when thrown forward by the opening of the mouth their under ends project beyond the snout. The *lower jaw* is a little longer than the upper one: its knobbed tip fits into a depression between the intermaxillaries. The *gill-membranes* are plaited at their insertion into the isthmus. The *cheeks* are nearly covered by the sub-orbital bones.

**TEETH** not perceptible on the jaws, but there is a small plate of minute ones on the centre of the tongue: there are also two rows of minute teeth on the inner sides of the cartilaginous *rakers*. Each branchial arch is furnished with a single row of rakers, the central ones of the upper arch, which are the longest, measuring half an inch.

**FINS.**—*Br.* 8; *D.* 14—0; *P.* 16; *V.* 12; *A.* 8; *C.* .

The first two rays of the *dorsal* are short. The *caudal* has a shallow fork.

**INTESTINES.**—The *alimentary* canal descends from the gullet for an inch and a half, it is then bent upwards for another inch and is more dilated, but there is no extraordinary thickening of the coats as in the Attihawmeg: its thick lining is disposed in six longitudinal folds, and forms a prominent ring at the pylorus, where it evidently terminates. Between the pylorus and the upper end of the abdominal cavity there is a thin bag, having the same width with the fundus of the stomach; it is lined by a firm, somewhat glandular, membrane, perforated by the mouths of numerous *cæca*. The slender intestine runs straight downwards to the anus from this dilated commencement: its under half, furnished with regular *valvulae conniventes*, has a greater caliber than its upper half. There are in all about one hundred and twenty *cæca*, inserted into the dilated sac, and a short way down the slender tube of the intestine. The *gall-duct* opens near the pylorus. The *spleen* is long and large. The *melt* has a wood-brown colour.

\* I have omitted such parts of my original notes as agree with the preceding account of the Attihawmeg and are more generic than specific.

## DIMENSIONS.

	Inches.		Inches.
Length from tip of snout to base of central caudal rays . . . . .	14	Length of alimentary canal . . . . .	11½
"        "        anus . . . . .	11½	"        "        from gullet to pylorus . . . . .	2½
Greatest depth of body . . . . .	4½	"        "        pylorus to anus . . . . .	9

[77.] 3. SALMO (COREGONUS) ARTEDI. (Le Sueur.) *Le Sueur's Herring Salmon.*

*Coregonus Artedi.* Le SUEUR, *Journ. Ac. Sc. Phil.*, i, p. 231.

This species having been taken in Lake Erie and the Niagara River, requires to be noticed in this work. M. Le Sueur says that it is locally known by the name of Herring-salmon, and is considered to be very delicate food. As it did not fall under our notice, we shall transcribe the description given of it by its discoverer.

## DESCRIPTION

Quoted from M. Le Sueur.

"*Body* sub-fusiform, a little elevated at the back; *head* small, having an osseous radiated plate which is covered by the skin; snout pointed."—"In *form* this species approaches the *scombri*, a section of it is oval. *Head* small and narrow; snout short, terminated by small intermaxillaries; *maxillaries* wide, sharp-edged as in the herring, edges entire; *mandibles* carinate, producing inwardly a triangular pedunculate expansion; very small conical teeth inserted in the skin of the lips at the extremity of the jaws: these teeth were sufficiently manifest in a small individual, but not visible in a larger one, a female, which came under my observation. Rays in the osseous plate of the head tubular, and open at the exterior, some tending backwards, and others towards the end of the snout. A faint carinate line divides the top of the head in the dried specimen. *Lateral line* straight and near the middle; *nostrils* double, close to the end of the snout and articulation of the maxillaries; *scales* round, approximated, easily falling off; the base of the tail is covered with them. *Colour* ash-blue at the back, paler and silvery on the rest of the body, with yellow tints on the tail, head and dorsal; *iris* whitish, pupil black. *Length* ten to twelve inches.

"*FINS.*—*Br.* 9; *P.* 16; *D.* 12—0; *V.* 12; *A.* 13; *C.* —g."

M. Le Sueur, in comparing our *Attihawmeg*, or his *Coregonus albus*, with *C. Artedi*, says that it has a less fusiform body, and the back elevated from the nape to the dorsal. "The *C. albus*," he further states, "has more depth of body, a greater elevation of back, and much stronger proportions in its body, fins, and scales. The adipose fin, which is broad, appears to consist of delicate rays, much pressed and in pairs." A careful examination of the dried specimens of our *C. albus* from Lake Huron, exhibited no rays whatever, nor any interspinous bones to support them, but the fin in drying splits in a fibrous manner.

[78.] 4. SALMO (COREGONUS) QUADRILATERALIS. (Richardson.) *The Round-fish.*

*Coregonus quadrilateralis.* RICHARDSON, *Franklin's Journ.*, p. 714.  
Kathèh. COPPER INDIANS. Okougnak. ESQUIMAUX.

PLATE 89, f. 1, A and B, one-half nat. size.

This *Coregonus* exists in the Polar Sea, off the mouths of the Coppermine and Mackenzie, and in all the clear rivers and lakes north of the 62nd parallel of latitude, being thus an inhabitant of both salt and fresh water, though we have no information as to its quitting the one for the other at any stated period\*. Our Esquimaux interpreter, Augustus, informed us that his countrymen who frequent the shores of the Welcome are well acquainted with it. Though a general inhabitant of the northern waters, it is not so plentiful as the Attihawmeg, nor so gregarious, neither is it equally prized as an article of food. When in the fresh waters it preys on larvæ and soft insects. I have to regret that the stomachs of those we took at sea were not examined, but it seems to obtain food there well suited to its wants, as the individuals we caught in Bathurst's Inlet, on the 6th of August, were larger, fatter, and brighter in colour, than those we obtained inland. It spawns in September.

From the body of this species being less compressed than that of the Attihawmeg, our voyagers named it the Round-fish, and I have given it the specific appellation of *quadrilateralis*, on account of a flattening of the back, belly, and sides being superadded to its general sub-fusiform shape. Baron Cuvier made the following observation on the specimen which I submitted to his inspection:—  
“*Coregone voisine du Salmo maræna. Nous en avons une très semblable du Lac Ontario ; elles diffèrent du poisson des Lacs de Suisse parce qu'elles ont le museau un peu plus pointu.*”

DESCRIPTION

Of a specimen taken in Great Bear Lake, lat. 64½° N.

SCALES smaller than those of the Attihawmeg and very regularly disposed, the uncovered portion of each having a rhomboidal form. A scale taken from the side measures four lines transversely, and half a line less in the other direction : its outline presents five or six very slight

\* A Scottish species of *Coregonus* which inhabits the Castle Loch of Lochmaben, and is locally known by the name of *Vendise*, has been taken in the Solway Firth, but as the fisherman in whose net it was caught was totally unacquainted with the species, it perhaps merely strayed accidentally to the sea.

angular projections, and its surface is destitute of any radiating furrows, having only the usual fine concentric striæ. The scales on the anterior part of the back have short marginal ridges, causing them to appear as if finely toothed. The *lateral line* is straight, equidistant from the dorsal and ventrals; the scales composing it are smaller than the adjoining ones and truncated, the uncovered portion being nearly triangular; they are ninety-six in number, including six very small ones on the caudal. A vertical line before the dorsal contains twenty-three or twenty-four scales, of which nine are above the lateral line and eight between it and the ventrals. A linear inch on the sides contains six scales or six and a half.

COLOUR of the *back* and sides intermediate between honey-yellow and wood-brown, with a narrow blackish-grey border to each scale: the tints are paler on the *sides*, and the *belly* is pearly-white. The *scales* are bright. The *cheeks*, *gill-covers*, and *irides* have a yellow colour with metallic lustre, and the *fins* are also mostly yellowish.

FORM elegant. *Profile* lanceolate tapering evenly into the tail: the belly rather less curved than the back, which is moderately arched. The *body* is four-sided with the angles rounded off: the depth one-fifth of the total length, excluding the caudal, and the thickness two-thirds of the depth. *Head* small, being only one-sixth of the length from the tip of the snout to the end of the scales on the caudal: it is of considerable breadth at the nape, and becomes one-fourth narrower between the anterior edges of the orbits, where it rounds off suddenly into a thin snout, which droops in profile. In the dried specimen there is a short sagittal crest between the orbits, and also lateral tubular ridges as in the Attihawmeg, but the former does not end in a furrow. The *orbit* is exactly its own diameter from the end of the snout, and two diameters and a half from the edge of the gill-cover. The *nostrils* are nearer to the orbit than to the tip of the snout. The *mouth* is remarkably small, and its orifice is quadrangular, the end of the lower jaw being truncated to the same width with the horizontal edge of the small intermaxillaries. The *labials* are very small, particularly their appophysis; their tips fall short of the orbit. The *under jaw*, even when depressed to the utmost, does not reach so far forward as the tip of the snout. The *suboperculum* is widest anteriorly, and the *operculum* is heart-shaped. No TEETH whatever can be perceived, even with a lens, in the dried specimen: the branchial *rakers* are small and soft.

FINS.—*Br.* 7\*; *D.* 15—0; *P.* 15; *V.* 11; *A.* 13; *C.* 19.

The *dorsal* is farther forward than in the Attihawmeg, the distance from the end of the snout to its first ray, when carried backwards, scarcely reaching the adipose fin, while in the latter species it passes it. The centre between the tip of the snout and end of the scales on the caudal is under the penultimate dorsal ray. The *adipose* is partly posterior to the anal. The *caudal* is forked.

INTESTINES.—Stomach like that of the Tullibee, the pylorus very narrow. *Cæca* eighty-seven, crowded under the pylorus where they surround the gut, and also occupying one-third of its length in three or four rows. The lower third of the intestine is furnished with *valvula conniventes*, half an inch of it at the anus being smooth. *Fæces* black.

\* This seems to be the prevalent number of gill-rays, but some of the individuals taken in the Arctic Sea had eight.



	DIMENSIONS.				
	Inches.	Lines.		Inches.	Lines.
Length from tip of snout to tip of caudal . . . . .	18	9	Length of attachment of dorsal . . . . .	2	1
" " end of central rays . . . . .	18	0	" its longest rays . . . . .	2	1
" " end of scales . . . . .	17	0	" its last ray . . . . .	0	8
" " anus . . . . .	12	9	" pectorals . . . . .	2	2
" " ventrals . . . . .	8	2	" ventrals . . . . .	1	10
" " dorsal . . . . .	7	0	" attachment of anal . . . . .	1	3
" " edge of gill-cover . . . . .	2	9½	" its longest rays . . . . .	1	7
" " nape . . . . .	1	11	" lobes of caudal . . . . .	2	6
" " orbit . . . . .	0	7	" its central rays beyond the scales . . . . .	0	11
" " nostrils . . . . .	0	5	Depth of caudal fork . . . . .	0	8
" of intermaxillaries, vertically . . . . .	0	2½	Breadth of snout between the articulations of		
" labials . . . . .	0	6½	the labials . . . . .	0	2
" lower jaw . . . . .	0	10	" nape . . . . .	1	3
" lateral line from gill-opening to			Depth of body . . . . .	3	6
end of scales . . . . .	14	3			

[79.] 5. SALMO (COREGONUS) LABRADORICUS. (Richardson.)  
*Musquaw River Coregonus.*

Mr. Cumming did me the favour of preparing a specimen of this *Coregonus*, which inhabits Musquaw River, that falls into the Gulf of St. Lawrence, near the Mingan Islands. The colours and exact form of the body cannot be determined from the dried specimen, but in the shape of the scales and opercular pieces it resembles the Attihawmeg, though its labials, and consequently the orifice of its mouth, are much smaller.

DESCRIPTION.

FORM.—*Body* apparently much like that of the Round-fish: its depth is one-fifth of the length, excluding the caudal. *Head* small, constituting only a sixth part of the distance between the tip of the snout and end of the scales on the caudal. The *orbit* is exactly twice as far from the edge of the gill-cover as from the tip of the snout. *Cranial ridges* nearly as in the Round-fish. The *labials* are a little longer than in that fish, and their posterior pieces are of a different shape, being ovate, whereas they are acutely elliptical in the other. The *under jaw* measures a very little more than one-half the length of the upper surface of the head, and when the mouth is distended its tip is exactly even with the end of the snout. *Jaws* and palate *toothless*: four longitudinal rows of *teeth* on the tongue.

*SCALES* orbicular, thin, flexible, and deciduous, seventy-eight on the lateral line, corresponding with an equal number of rows on the back and belly. The middle, between the tip of the snout and end of the scales, is at the thirty-second scale of the lateral line, and opposite to the third ventral ray, or tenth dorsal one. A linear inch, measured on the sides, includes seven scales. There are eight scales between the dorsal and lateral line, and as many between the latter and the ventrals.

FINS.—*Br.* 8—9; *D.* 15—0; *P.* 15; *V.* 12—11; *A.* 15; *C.* 19½.

The three anterior rays of the *dorsal* are short, as are also the two first anal ones. The first ray of the *ventral* is opposite to the space between the eighth and ninth dorsal ray. The *adipose* corresponds with the end of the *anal*, and the attachment of the latter equals the space between its last ray and the outermost of the nineteen longer caudal rays.

## DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from tip of snout to tip of caudal	. 14	0	Length of lower jaw	0	8½
" " central rays	. 13	0	" attachment of dorsal	. 1	5
" " end of scales	. 12	4	" its longest ray	. 1	7½
" " anus	. 9	3	" pectorals	. 1	4
" " ventrals	. 5	11	" ventrals	. 1	5
" " dorsal	. 5	6	" attachment of anal	. 1	3½
" " edge of gill-cover	. 2	0	" its longest ray	. 1	7½
" " nape	. 1	5	" lobes of caudal	. 2	3
" " centre of pupil	. 0	8½	" its longest rays	. 2	0
" " edge of orbit	. 0	6	" central rays	. 0	8
" of lateral line	. 10	8	Depth of caudal fork	. 0	10
" intermaxillaries, vertically	. 0	3	" body	. 2	5
" labials	. 0	5	Spread of caudal	. 2	6

[ 80.] 6. SALMO (COREGONUS) LUCIDUS. (Richardson.) *Bear Lake*  
*Herring-Salmon.*

PLATE 90, f. 1, A and B, one-half nat. size.

Baron Cuvier's remark on our specimen of this fish was, "*Coregone, encore plus semblable au Salmo maræna que le Round-fish: Mais les écailles du Salmo maræna sont plus grandes que celles de le Herring-Salmon.*" We have not had an opportunity of comparing the American species with the *maræna*, but the *lucidus* and *quadrilateralis* differ much from each other in the form of the body, as well as in other particulars, such as the size and shape of the scales, the breadth and comparative length of the snout, and the size of the labials and aperture of the mouth. The *C. lucidus* has a compressed body, like a species which we have received from Lake Lemán under the name of *La fera*, and also like the *Vendace*, or *Vendise*\*, from Lochmaben in Scotland, but the scales of these two are smaller; the *Fera* has larger intermaxillaries like the *Attihawmeg*, and the *Vendace* has an acute under jaw, which forms the extreme point of the head when the mouth is closed. None

\* *Piscis in lacu Mabano, Vandensis.* SIBBALD., *Scot. Illustr.*, lib. 3, p. 26. Tradition says that King Robert Bruce introduced this fish into the Castle Loch from France.

of the American coregoni, described in this work, have the snout so decidedly posterior to the tip of the under jaw as the Lochmaben fish, the nearest approach to it being the Lake Huron Herring-Salmon, to be afterwards described.

The Bear Lake Herring-Salmon was seen by us nowhere but in the great sheet of water whence it derives its trivial name. That lake extends from the 65th to the 67th parallel of latitude, and is remarkably clear and deep. Its surplus waters are carried off by a large stream which falls into the muddy current of the Mackenzie, and there are no rapids, between it and the sea, that fish cannot surmount, yet none of the anadromous salmon of the Arctic Sea have been known to enter the lake; the *Salmo Mackenzii* confining its migrations in fresh water to the Great Slave Lake, and the turbid branches of the Mackenzie River. The *Namaycush*, *Masamècoos*, *Attihawmeg* of large size and very fine quality, *Round-fish*, and *Back's grayling*, are taken in Great Bear Lake, but none of them so abundantly as the *C. lucidus*, of which the nets yielded us fifty thousand in the year 1825-6\*. The lake begins to freeze in October, and in the course of November most of its narrower arms are covered with ice, but, according to Indian report, its centre is not closed for the season before the beginning of January, and during the whole winter a small piece of water continues open at the point from whence the Bear Lake River issues. The ice begins to break up in shallow bays towards the end of May, and is entirely gone by the end of June. In September the nets were set near Fort Franklin, at the influx of a river about four miles from the outlet of the lake, and their daily produce was between three and four hundred Herring-Salmon. Though the fish continued to be equally plentiful at that spot during October, the fishery was discontinued on account of the floating ice, which did not become firm enough for the nets to be set with safety under it before the middle of November; and in the beginning of December the Herring-Salmon, resorting in numerous shoals to the outlet of the lake, were of course followed thither by the fishermen. At this spot, the water was three or four fathoms deep, but the fish could be easily seen through the clear ice, which enabled the Indians to spear a few, though more fell a prey to the otters. In January the fishery was not only unproductive, but several of our party suffered severely from the bad quality of the fish, whose intestines contained at this time a matter so caustic as to blister the hands of those whose duty it was to clean them. From the end of February the fish daily improved in quantity and quality, until the rivers opened in May, when the fisheries were again removed to the mouths of several small streams which fall into the lake.

\* In eighteen months we obtained about three thousand five hundred trout, none weighing less than two pounds, and some exceeding thirty.

*Attihawmeg* and *Namaycush* differ from the Herring-Salmon in resorting to the greatest depths of the lake in the winter, and it may be here observed, that fish can receive a free supply of fresh air during that season, even in the centre of the most extended lake, through the wide rents caused by contraction of the ice at low temperatures. Warmer weather causes the ice to expand again, and great blocks of it are then forced up through the crevices, so as to form walls sometimes twenty feet in height. The memoranda of various particulars respecting the habits and anatomical structure of the Herring-Salmon, that I made during our residence on Great Bear Lake, were lost in the struggle that we had subsequently with the Esquimaux, and at this distance of time I cannot supply the loss from memory.

## DESCRIPTION

Of a specimen taken in Great Bear Lake.

FORM in *profile* closely resembling the Round-fish, but the *body* is much more compressed, and the *head* larger, being one-fifth of the length between the tip of the snout and end of the scales on the caudal, and nearly equal to the greatest depth of the body. In the dried specimen, the breadth of the nape equals the distance between the supra-orbital plate of the frontal bone and the articulation of the lower jaw, and the width between the upper ends of the labials is twice as great as in the Round-fish. The sagittal ridge rises into an acute crest from the nape to the nostrils, and the tubular ridges on the frontal bone and anterior sub-orbitals, are more conspicuous than in any of the preceding species. The *orbit* is situated the length of its diameter from the end of the snout, and thrice as far from the edge of the gill-cover. The orifice of the *mouth* is large in comparison with that of the other coregoni, equaling the orbit in diameter: when the jaws are extended, the intermaxillaries are brought into a line with the forehead, instead of dropping vertically as in the Round-fish. The *labials* are large, and have a widely oblong form, carrying their breadth close to both extremities; their tips, when the mouth is shut, reach as far back as the centre of the orbit; the anterior piece is traversed by an obtuse keel, and the posterior one is only half as long, and less than half as wide as the anterior one. There are no *teeth*. *Gill-covers*. The preoperculum is broader than usual, particularly its upper limb: there are four conspicuous tubular rays on its lower limb. The *interoperculum* is large, being bigger than that of the *Attihawmeg*. The posterior margin of the gill-cover is uneven or slightly lobed.

FINS.—*Br.* 8—8; *D.* 14—0; *P.* 19; *V.* 11; *A.* 14; *C.* 19½.

The eighth ray of the *dorsal*, the first of the *ventrals*, and the thirty-third scale of the lateral line, are situated midway between the tip of the snout and end of the scales on the caudal. The *ventral appendages* are slender and unusually long. The *adipose* is about its own breadth posterior to the anal, which is smaller than in the *Attihawmeg*. The *caudal* is deeply forked.

SCALES transversely oval, considerably larger than those of the Round-fish, but smaller than those of the *Attihawmeg*; one from the side measures five lines vertically, and four

longitudinally, the uncovered edge is a segment of a large circle, the base is rather angled, or widely three-lobed. There are eighty-eight scales on the lateral line; ten rows above that line at the dorsal, eight between it and the ventral, and three or four from thence to the mesial line of the belly. The scales on the sides are larger than those of the back; a linear inch includes six of them. The *lateral line* is straight and equidistant from the dorsal and ventrals.

COLOUR.—The scales have much pearly and iridescent lustre. In the dried specimen the back is lighter than that of the other coregoni, and the sides of the head yield strong greenish and golden reflections\*.

## DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from tip of lower jaw to tips of caudal	18	4	Length of lower jaw	1	5
"    "    snout † to ditto	18	0	"    lateral line	13	2½
"    "    end of central rays	17	0	"    attachment of dorsal	1	7½
"    "    end of scales	16	0	"    its longest rays	1	9½
"    "    anus	12	0	"    its last ray	0	9½
"    "    ventrals	8	1½	"    pectorals	2	2½
"    "    dorsal	7	4½	"    ventrals	3	0½
"    "    edge of gill-cover	3	1	"    their appendages	0	11
"    "    nape	1	11	"    attachment of anal	1	5
"    "    orbit	0	8½	"    its longest ray	1	4
"    "    nostrils	0	3½	"    its shortest ray	0	6
"    of intermaxillaries, vertically	0	2½	"    lobes of caudal	3	4
"    labials	0	10½	"    central rays of ditto	0	8
"    space between articulations of ditto	0	6	Depth of caudal fork	1	3

[81.] 7. SALMO (COREGONUS) HARENGUS. (Richardson.) *Lake Huron Herring-Salmon.*

PLATE 90, f. 2, A and B, one-half nat. size.

This fish is plentiful at Penetanguishene on Lake Huron, but I am unable to determine whether it be the same with the *C. Artedi* of Le Sueur, which we have already noticed as an inhabitant of Lake Erie. Baron Cuvier's remark upon our specimen was, "*Espèce nouvelle voisine des Coregones.*" It resembles *C. lucidus* very nearly, its larger head, smaller scales, and a slight difference in the position of its ventrals being the principal distinctive characters I have been able to detect in the dried specimens. Having lost my notes of the dissections which I made of *C. lucidus*, and having examined the recent specimens of *C. harengus* only cur-

\* My notes of the appearance of the recent fish were lost, as I have stated above.

† The articulations of the labials and intermaxillaries are considered as the end of the snout, not the edges of the latter, which, when the mouth is open, are extended on a line with the upper surface of the snout.

sorily, I can say nothing respecting any differences that may exist in their viscera. An argument against the identity of the species may be adduced from their habitats being upwards of twenty degrees of latitude apart.

The Lake Huron Herring-Salmon is gregarious like the Bear Lake one, and frequents sandy bays during the summer months. It spawns in April and May, and at that time is occasionally seen in rivers. According to Mr. Todd's observations it is "a timid fish, appears to be in constant rapid motion, and associates in shoals in pursuit of the fry of the small fishes on which it feeds." As an article of diet it is well tasted and wholesome, though much less rich and agreeable than the Attihawmeg.

## DESCRIPTION

Drawn up from notes made at Penetanguishene, aided by a re-examination of the dried specimens.

COLOUR, in the recent fish, olive-green on the *back*, silvery on the *sides* and *belly*, and blackish-green on the top of the head: the gill-covers, cheeks, and irides are whitish and nacre.

SCALES of the same form with those *C. lucidus*, but only of two-thirds the size: on the sides their transverse diameter is four lines, their longitudinal one rather more than three, and when *in situ*, eight are included within a linear inch. There are eighty-four on the lateral line\*, and twenty-two in a vertical row under the dorsal, of which nine are above the lateral line, and eight between it and the ventrals. The lateral line is straight.

FORM.—*Body* compressed, back rounded, belly slightly flattened, the greatest thickness, however, being at the lateral line, which is rather nearer to the back than to the belly: the height of the body, at the dorsal, is double its thickness. *Profile* like that of *C. lucidus*, the head being, however, more acute †. The *snout* is obtuse, when seen in front or from above, and the vertex is smooth and rounded in the recent fish: in the dried specimen the radiated tubular lines near the nape, the sagittal ridge and other eminences, appear as in *C. lucidus*, but not so prominently. The length of the *head* is more than one-fourth of the distance between the tip of the snout and end of the scales on the caudal, and somewhat less than one-fifth of the total length, including the lobes of the caudal. In the position of the eye, and the forms of the jaws and opercular bones, this species scarcely differs from *C. lucidus*. When the *mouth* is fully open its orifice measures seven lines vertically, and five and a half transversely: the under jaw, which is narrow but not acute, then projects about four lines beyond the articulations of the labials.

TEETH, none on the jaws, vomer, or palate, but three rows of very slender ones on the tongue may be perceived by the aid of a lens. *Rakers* stiff, subulate, and rough on the margins, the middle ones of the first arch, which are the largest, measuring five lines.

\* One specimen had only seventy-seven scales on the lateral line, but the same as the above in a vertical row.

† The figure, which was taken from a dried specimen, presents a less elegant profile than that of the recent fish.

FINS.—*Br.* 9—9; *D.* 12 or 13—0; *P.* 16; *V.* 12; *A.* 13; *C.* 19 $\frac{1}{2}$ .

The *ventrals* originate under the sixth or seventh *dorsal* ray, but the structure and form of all the fins are nearly as in *C. lucidus*. The *adipose* is not supported by interspinous bones, but it exhibits in the dried specimen a very fine, apparently, fibrous structure, which entirely disappears when the fin is moistened. In one specimen the centre between the tip of the snout and end of scales on the caudal, corresponds with the first ray of the *ventrals* and thirtieth scale of the lateral line, in another it is a little posterior to the first ventral ray, being at the thirty-third scale of the lateral line: in the last specimen the lateral line has seven scales more than the other.

## DIMENSIONS

Of two dried specimens.

	No. 1.		No. 2.	
	Inches.	Lines.	Inches.	Lines.
Length from tip of lower jaw to tip of caudal	13	10	12	7
" " snout to ditto	13	5 $\frac{1}{2}$	12	3 $\frac{1}{2}$
" " end of central rays	12	3	11	7
" " end of scales	11	9	11	0
" " anus	8	6	8	0
" " ventrals	5	10 $\frac{1}{2}$	5	7
" " dorsal	5	4 $\frac{1}{2}$	5	2
" " edge of gill-cover	2	7	2	5
" " nape	1	7 $\frac{1}{2}$	1	6 $\frac{1}{2}$
" " orbit	0	7	0	6 $\frac{1}{2}$
" " nostrils	0	3	0	3
" of intermaxillaries, vertically	0	2 $\frac{1}{2}$	0	2
" labials	0	8	0	8
" lower jaw	1	2 $\frac{1}{2}$	1	1 $\frac{1}{2}$
" lateral line	9	3	8	9
" attachment of dorsal	1	2 $\frac{1}{2}$	1	1
" its longest rays	1	7	1	5
" its last ray	0	7	0	6 $\frac{1}{2}$
" adipose fin	0	6	0	4 $\frac{1}{2}$
" pectorals	1	8 $\frac{1}{2}$	1	7 $\frac{1}{2}$
" ventrals	1	6	1	6
" ventral appendages	0	7	0	6
" attachment of anal	1	2	1	1
" its longest rays	1	0	1	0
" its last ray	0	4 $\frac{1}{2}$	0	4 $\frac{1}{2}$
" lobes of caudal	2	8	2	4
" its central rays, beyond the scales	0	8 $\frac{1}{2}$	0	6
Depth of caudal fork	1	1	1	1

I subjoin the dimensions of two European *Coregoni* alluded to in the preceding pages, that they may be compared with the American species.

	La Fera.		The Vendace.	
	Inches.	Lines.	Inches.	Lines.
Length from tip of snout to tip of caudal . . . . .	0	0	8	2
" " end of central rays . . . . .	0	0	7	6
" " end of scales . . . . .	9	8	6	11
" " posterior edge of adipose fin . . . . .	8	7	5	10
" " anus . . . . .	7	4	5	1
" " ventrals . . . . .	4	9	3	6
" " dorsal . . . . .	4	0	3	2½
" " gill-cover . . . . .	2	1½	1	6½
" " nape . . . . .	1	5½	1	0½
" " centre of pupil . . . . .	0	8½	0	6½
" " edge of orbit . . . . .	0	6	0	3½
" of axis of orbit . . . . .	0	6	0	6½
" intermaxillaries, vertically . . . . .	0	3½	0	1½
" labials . . . . .	0	7	0	5½
" under jaw . . . . .	0	10	0	7½
" attachment of dorsal . . . . .	1	4	0	8½
" its longest rays . . . . .	2	0	1	6
" caudal lobes . . . . .	0	0	1	9
" central caudal rays . . . . .	0	0	0	5

The *Coregonus fera* (Jurine) resembles our Attihawmeg, or *C. albus*, in the shape of the head, cranial ridges and depressions, and opercular bones, but its body is much more compressed, having more nearly the form of our Herring-Salmon. The under jaw, when depressed, reaches beyond the snout. There are no visible teeth on the labials or roof of the mouth, some minute ones exist on the intermaxillaries, and the conical tongue is covered with teeth, which, though very slender, can be readily seen. There are about seventy scales on the lateral line. The ventrals are under the eighth or ninth dorsal rays, and their appendages are short and three-edged. The stomach of my specimen contained a quantity of sand and the remains of two fish, one a percoid fish, the other apparently a coregonus, with scales as large as those of the fera itself. The following are the lengths of the parts of the alimentary canal.

	Inches.	Lines.		Inches.	Lines.
Distance between gullet and bend of stomach . . . . .	3	0	Distance between last cæcum and <i>valvula</i>		
Length of thick part of stomach . . . . .	1	2	<i>conviventes</i> . . . . .	2	2
Distance between pylorus and last cæcum . . . . .	2	3	Length of gut occupied by ditto . . . . .	2	2
" last cæcum and anus . . . . .	4	7	" smooth gut at anus . . . . .	0	3
Length of whole canal . . . . .	11	0	Length of gut below cæca . . . . .	4	7

The *Vendace* of Lochmaben (*Coregonus vandesius*) has a much larger eye than the Fera. Its lower jaw projects beyond the upper one, even when the mouth is shut. There are seventy-three scales on the lateral line. A male taken in the Solway Firth, with the melt about one-third of the full size, had some small pieces of the stems of grass and a few grains of quartzose sand in its stomach, apparently fragments of the case of the cod-bait. Mr. Yarrell has found shells in the stomachs of individuals taken in the Castle Loch, while Dr. Knox ascertained that those he examined had been feeding upon minute *malacostraca*.



In the paucity of our information respecting the fish of New Caledonia, the following notices, collected from the Journal of Mr. D. W. Harmon, a partner of the North West Company, are valuable. This gentleman resided for several years at a fur-post on Stuart's Lake, which lies in the 55th parallel of latitude, and 125th degree of longitude, and which discharges its waters by a stream, named also Stuart, into Frazer's River, that falls into the Strait of Juan da Fuca. As his remarks upon fish relate chiefly to the Salmon tribe, this appears to be the most appropriate place for their insertion.

" 1811. *May* 11. STUART'S LAKE. The ice in the lake broke up this afternoon. 22. We now take *trout* in the lake, with set lines and hooks, in considerable numbers, but they are not of a good kind. It is perhaps a little remarkable, that *pike* or *pickarel* have never been found in any of the lakes and rivers on the west side of the Rocky Mountains.

" *August* 2. It is impossible at this season to take fish out of this lake or river. Unless the *salmon* from the sea soon make their appearance our condition will be deplorable. 10. Sent all our people to a small lake about twelve miles off, out of which the natives take *small fish*, much resembling salmon in shape and flavour, but not more than six inches long. They are said to be very palatable. 22. One of the natives has caught a salmon, which is joyful intelligence to us all, for we hope and expect in a few days to have abundance. These fish visit, to a greater or less extent, all the rivers in this region, and form the principal dependence of the inhabitants as the means of subsistence. The natives always make a feast to express their joy at the arrival of the salmon. The person who sees the first one in the river exclaims, *Tá-loe naslay! tá-loe naslay!* Salmon have arrived! salmon have arrived!—The exclamation is caught up with joy, and repeated with animation by every body in the village.

" *September* 2. We have now the *Common salmon* in abundance. They weigh from five to seven pounds. There are also a few of a larger kind, which will weigh sixty or seventy pounds. Both of them are very good when just taken out of the water. But when dried, as they are by the Indians here by the heat of the sun, or in the smoke of a fire, they are not very palatable. When salted they are excellent. As soon as the *salmon* come into Stuart's Lake they go in search of the rivers and brooks that fall into it, and these streams they ascend so far as there is water to enable them to swim; and when they can proceed no farther up, they remain there and die. None were ever seen to descend these streams. They are found dead in such numbers, in some places, as to infect the atmosphere with a terrible stench, for a considerable distance round. But even when they are in a

putrid state the natives frequently gather them up and eat them, apparently with the same relish as if they were fresh.

“ *October 21.* We have now in our store twenty-five thousand salmon. Four in a day are allowed to each man. I have sent some of our people to take *white fish* (Attihawmeg).

“ *November 16.* Our fishermen have returned to the fort, and inform me that they have taken seven thousand white fish. They weigh from three to four pounds, and were taken in nine nets of sixty fathoms each. 17. The lake froze over in the night.

“ 1812. *January 30.* I have returned from visiting five villages of the Nateotains, built on a lake of that name, which gives origin to a river that falls into Gardner's Inlet. They contain about two thousand inhabitants, who subsist principally on salmon and other small fish, and are all well made and robust. The salmon of Lake Nateotain have small scales, while those of Stuart's Lake have none.

“ *May 23.* Stuart's Lake. This morning the natives caught a *sturgeon* that would weigh about two hundred and fifty pounds. We frequently see much larger ones, which we cannot take for want of nets sufficiently strong to hold them.

“ *August 15.* *Salmon* begin to come up the river. Few salmon came up Stuart's River this fall, but we procured a sufficient quantity at Frazer's Lake and Stillas. These lakes discharge their waters into Frazer's River, which is about fifty rods wide, and has a pretty strong current. The natives pass the greater part of the summer on a chain of small lakes, where they procure excellent white fish, trout, and carp; but towards the latter part of August they return to the banks of the river, in order to take and dry salmon for their subsistence during the succeeding winter.

“ 1813. *August 12.* *Salmon* have arrived.

“ 1814. *August 5.* *Salmon* begin to come up the river. They are generally taken in considerable numbers until the latter part of September. For a month they come up in multitudes, and we can take any number we please.

“ *September 20.* We have had but few salmon this year. It is only every second season that they are numerous, the reason of which I am unable to assign.

“ 1815. *August 13.* FRAZER'S LAKE. *Salmon* begin to come up the river, which lights up joy in the countenances both of ourselves and of the natives, for we had all become nearly destitute of provisions of any kind.

“ 1816. *September 9.* *Salmon* begin to come up this river.

“ 1817. *August 6.* STUART'S LAKE. *Salmon* arrived. In the month of June

we took out of this lake twenty-one *sturgeon*, that were from eight to twelve feet in length. One of them measured twelve feet two inches from its extreme points, four feet eleven inches round the middle, and would weigh from five hundred and fifty to six hundred pounds. All the sturgeon that we have caught, on this side of the mountain, are far superior in flavour to any I ever saw in any other part of the world.

“ The *Carrier Indians* reside a part of the year in villages, built at convenient places for taking and drying salmon, as they come up the rivers. These fish they take in abundance with little labour; and they constitute their principal food during the whole year. They are not very unpalatable when eaten alone, and with vegetables they are very pleasant food. Towards the middle of April, and sometimes sooner, the natives leave their villages, to go and pass about two months at the small lakes, from which, at that season, they take white fish, trout, carp, &c., in considerable numbers. But when these begin to fail, they return to their villages and subsist on the small fish which they dried at the lakes, or on salmon, should they have been so provident as to have kept any until that late season; or they eat herbs, the inner bark or sap of the cypress tree (*pinus Banksiana*), berries, &c. At this season few fish of any kind are to be taken out of the lakes or rivers of New Caledonia. In this manner the natives barely subsist, until about the middle of August, when salmon again begin to make their appearance in all the rivers of any considerable magnitude; and they have them at most of their villages in plenty until the latter end of September, or the beginning of October. For about a month they come up in crowds, and the noses of some of them are either worn or rotted off, and the eyes of others have perished in their heads; yet in this maimed condition they are surprisingly alert in coming up rapids. These maimed fishes are generally at the head of large bands, on account of which the natives call them *mee-oo-tees*, or chiefs. The Indians say that they have suffered these disasters by falling back among the stones when coming up difficult places in the rapids which they pass. The Carriers take salmon in the following manner. All the Indians of the village assist in making a dam across the river, in which they occasionally leave places to insert their baskets or nets of wicker-work. These baskets are generally from fifteen to eighteen feet in length, and from twelve to fifteen feet in circumference. The end at which the salmon enter is made with twigs in the form of the entrance of a wire mouse-trap. When four or five hundred salmon have entered this basket, they either take it to the shore to empty out the fish, or they take them out at a door in the top, and transport them to the shore in their large wooden canoes, which are convenient for this purpose. When the

salmon are thrown upon the beach, the women take out their entrails and hang them by the tails on poles in the open air. After they have remained in this situation a day or two, they take them down and cut them thinner, and then leave them to hang for about a month in the open air, when they will have become entirely dry. They are then put into store-houses, which are built on four posts, about ten feet from the ground, to prevent animals from destroying them, and, provided they are preserved dry, they will remain good for several years."—HARMON'S *Travels in North America*. 1820.

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Captain Dixon, who visited the North-west coast of America in the years 1786 and 1787, on a trading expedition, in company with Captain Portlock, mentions that they took great numbers of fine salmon with the seine in Cook's River, or Inlet (lat. 60°), in the month of July, and that in the end of June, in the following season, they saw large quantities hung up to dry by the natives of Norfolk Sound, a harbour formed by the Island of Sitka, where the Russian Fur Company's establishment of New Archangel has been since erected. Eschscholtz speaks of only one sort of salmon as frequenting that Sound, and remarks that it is well-flavoured, but Captain Dixon thought it inferior to the kind which he obtained in Cook's River.

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After the preceding pages had gone to the press, I received a letter from Dr. Gairdner, of Fort Vancouver, on the Columbia River, of which the following is an extract. "My duties at Vancouver prevent me from collecting many Columbia fish, as I have no leisure for journeys through the country. Such, however, as I happen to have by me, I now send you with great pleasure, for your work on North American Zoology; they are entirely fresh-water species, my travels not having as yet extended to the coast. I subjoin a short description of each, which I made from the recent specimens, the characters, particularly those dependent on colour and dimensions, being liable to alteration by the spirits. The early dispatch of the vessel leaves me no time for transcribing the anatomical details." Dr. Gairdner had used the precaution of wrapping the specimens in tow previous to putting them in spirits, and of soldering them up in a tin case, which was protected by a cask, yet all this care, I regret to say, did not insure them against the accidents of a long voyage. The tin case received some injury, and became so leaky as to suffer

much of the spirit to run out, and the consequence was, that six specimens of salmon were incorporated into one mass by the continued motion of the vessel. The other fish, being of a smaller size, less oily, and perhaps more indurated by longer immersion in spirits, arrived in better condition. By picking the bones of the salmon out of the putrid mass, I have been able to make a few additions to Dr. Gairdner's descriptions quoted below. In all the specimens the vertebræ are more numerous than in the European species. It is to be observed, that the two or three last vertebræ of the tail diminish rapidly in size and turn up, the square form of the termination of the vertebral column in the *Salmonoidæ* being produced by the dilatation of the interspinous bones attached to the under side of the curved point of the spine; while the corresponding upper interspinous bones are slender, awl-shaped, crowded, and irregular. The reader will find notices of the salmon of the North-west coast by referring back to pages 158 and 162, as well as in the passages quoted above from Harmon's Travels; and to complete the history of the fish of the Columbia, as far as known, I will add the mode of stacking the salmon, described in Lewis and Clarke's Journal. "Near our camp are five large huts of Indians engaged in drying fish, and preparing it for the market. The manner of doing this is by first opening the fish and exposing it to the sun on their scaffolds. When sufficiently dried, it is pounded fine between two stones, and is then placed in a basket about two feet long and one in diameter, neatly made of grass and rushes, and lined with the skin of a salmon stretched and dried for the purpose. Here they are pressed down as hard as possible, and the top covered with skins of fish, which are secured by cords through the holes of the basket. The baskets are then placed in some dry situation, the corded part upwards, seven being usually placed as close as they can be put together, and five on the top of them. The whole is then wrapped up in mats, and made fast by cords, over which mats are again thrown. Twelve of these baskets, each of which contains from ninety to a hundred pounds, form a stack, which is left exposed till it is sent to market; the fish thus preserved is kept sound and sweet for several years, and great quantities of it, they inform us, are sent to the Indians who live below the falls, whence it finds its way to the whites who visit the mouth of the Columbia. We observe, both near the lodges and on the rocks of the river, great numbers of stacks of these pounded fish." (Lewis and Clarke, ii., p. 275.) "The salmon (*S. quinnat*) is almost the only fish caught in great abundance above the falls; but below that place we observe the salmon-trout, and the heads of a species of trout smaller than the salmon-trout, which is in great quantities, and which they are now burying to be used as their winter food. A hole of any size being dug, the sides and bottom are lined

with straw, over which skins are placed; on these the fish, after being well dried, are laid, covered with other skins, and the hole closed with a layer of earth twelve or fifteen inches deep." (Idem, p. 278.) It is very probable that the same species of salmon may frequent the North-west coast and Kamtschatka, but Steller's descriptions, as quoted by Pennant, are not sufficiently detailed to enable us to identify them.

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[82.] 11. SALMO QUINNAT. — *The Quinnat.*

SUB-GENUS, Salmo. CUVIER.

"This is the species which ascends the Columbia earliest in the season, commencing its run in the month of May in enormous shoals, clearing the greater Dalles, cascades and rapids innumerable, and making its way to the sources of the river, where, at the close of the season, it is found dead on the beach in great numbers. The muscular power of this fish is truly astonishing, even in a class of the animal kingdom remarkable for vigorous movements, for it may be seen ascending channels at the Kettle Falls so rapid, that when a stone as big as a man's head is dropped into them, it is shot downwards with the swiftness of an arrow\*. Individuals of this species have often been seen with their noses fairly worn down to the bone, and in the last stage of emaciation, yet still striving, to the last gasp, to ascend the stream. The selection of particular streams for spawning is a remarkable feature in the history of the fish. It ascends the Walamet, Snake, and Kootanie rivers, &c., and passes by the Kawalitch, Okanagan, Dease's river and others, seeming to prefer a rapid stream interrupted by falls, to one of a quieter character, though other circumstances must regulate its choice, as some of the rivers which it refuses to enter have an extremely rapid current. It is this salmon which forms the main subsistence of the numerous hordes of Indians who live upon the banks of the Columbia, and it is known by the name of *quinnat*, for one hundred and fifty miles from the mouth of the river. It attains a large size, weighing often from thirty to forty pounds."—G. [The *quinnat* is evidently the "Common salmon" of Lewis and Clarke, whose description of it we have quoted in page 162. These travellers mention the first arrival of the salmon at the Skilloot village, below the site of Fort Vancouver, as having occurred on the 18th of April, in the year 1806.—R.]

\* In the map published by the Society for the Diffusion of Useful Knowledge, the descent at the Kettle Falls is stated as twenty-one feet; but Lewis and Clarke were of opinion that in high floods the water below the falls rises nearly to a level with that above them.—R.

" **COLOUR.**—General tint of the back bluish-grey, changing, after a few hours removal from the water, into mountain-green: sides ash-grey with silvery lustre: belly white: back above the lateral line studded with irregular rhomboidal or star-like black spots, some of them occluded. Dorsal fin and gill-covers slightly reddish: tips of the anal and pectorals blackish-grey: the dorsal and caudal thickly studded with round and rhomboidal spots, back of the head sparingly marked with the same. Whole body below the lateral line, with the under fins, destitute of spots. Lower jaw and tongue blackish-grey; roof of the mouth tinged here and there with the same. **SCALES** large. **TEETH** disappearing on the mesial line of the upper jaw, one row on each palate bone, a few small teeth on the forepart of the vomer, and two rows on the tongue. **FORM.**—Greatest convexity of the back at the origin of the dorsal; end of the caudal semilunar; adipose opposite to the posterior end of the anal; dorsal of greater height than length. **FINS.**—*Br.* 17; *P.* 16; *V.* 10; *A.* 16; *D.* 14—0; *C.* 19½.

## " DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Extreme length . . . . .	30	0	Length of pectorals . . . . .	3	7
Greatest height of body . . . . .	7	0	" ventrals . . . . .	3	0
" circumference of body . . . . .	18	0	Height of dorsal . . . . .	3	0
Circumference of tail at origin of caudal . . . . .	6	0	Length of ditto . . . . .	3	2½
Breadth between the eyes . . . . .	2	8½	Height of adipose . . . . .	1	4½
Length from tip of snout to nostrils . . . . .	1	6	" anal . . . . .	2	2½
" eyes . . . . .	2	3½	Length of ditto . . . . .	3	4½
" angle of preopercule . . . . .	5	2½	Height of caudal . . . . .	7	8½
" angle of opercule . . . . .	6	6	Length of its margins . . . . .	5	9½
" nape . . . . .	3	9½	" centre . . . . .	1	9½
" pectorals . . . . .	7	7	Distance of pectorals from ridge of the		
" dorsal . . . . .	13	0	back . . . . .	4	4½
" ventrals . . . . .	16	0			
" anal . . . . .	21	0			
" adipose . . . . .	23	0			

GAIRDNER, in *N.*

[The specimen of this salmon, though it is very soft and has lost its scales, still retains its form, so that I am able to add the following particulars to Dr. Gairdner's description.—General *form* much like that of a Salmon-trout (p. 140, No. 2). The *head* is exactly one-fourth of the length, from the tip of the snout to the end of the scales on the caudal. The snout is cartilaginous as in *S. salar*, and the length of the lower jaw rather exceeds that of the upper surface of the head. The edge of the *gill-plate* is an arc of a circle as in that species, but the suboperculum is still more sloped off, having much the form of that of *S. Scouleri* (pl. 93). There are sixteen *gill-rays* on the right side, and seventeen on the left. The largest *teeth* are those of the under jaw, of which there are eleven in each limb, placed at regular distances, with some small ones in the intervals attached to the soft parts only. The labial and intermaxillary teeth are similar to these, and but little inferior in size. The lingual-teeth, considerably smaller than those in the jaw, are placed in two parallel rows, five in each. The palatine-teeth are a little shorter than the lingual ones, and those on the vomer are the smallest of all, scarcely protruding through the soft parts in the recent specimen: there are nine of them—two in front, the others in a single series, running upwards of half an inch

backwards, or about two-thirds as far back as the palatine-teeth. The gullet is armed with small teeth above and below. The jaw-teeth are as big as those of the Salmon-trout, pl. 92, f. 1. There are sixty-six vertebræ in the spine. The pyloric cæca are very numerous, there being about one hundred and fifty-five of them, and their insertions surround the intestine from the pylorus until it makes a bend downwards, below which they continue to be inserted for a short way on one side of the gut only.

	Inches.	Lines.		Inches.	Lines.
Length from end of snout to tip of caudal	15	6	Length of alimentary canal	13	10
" " end of its central rays	14	5	" from gullet to bend of stomach	4	0
" " end of scales	13	5	" bend to pylorus	1	1
" of lateral line	10	10	" pylorus to last cæcum	3	6
" intermaxillaries	0	8	" of remainder of gut	5	3
" labials	1	3½			
" lower jaw	2	1½			R.]

[83.] 12. SALMO GAIRDNERII. (Richardson.) *Gairdner's Salmon.*

Queachts. NATIVES of the Banks of the COLUMBIA\*.

[The specific name which I have given to this salmon is intended as a tribute to the merits of a young though able naturalist, from whom science may expect many important acquisitions, and especially in the history of the Zoology of the North-west coast of America, should his engagements with the Hudson's Bay Company permit him to cultivate that hitherto neglected field of observation.—R.]

" This species ascends the river in the month of June, in much smaller numbers than the *quinnat*, in whose company it is taken. Its average weight is between six and seven pounds.

" COLOUR.—Back of head and body bluish-grey; sides ash-grey. Belly white. The only traces of variegated marking are a few faint spots at the root of the caudal. FORM.—Profile of dorsal line nearly straight, tail terminating in a slightly semilunar outline. Ventrals correspond to commencement of dorsal and adipose to end of anal. TEETH.—Jaws fully armed with strong hooked teeth, except a small space in centre of upper jaw. Vomer armed with a double row for two-thirds of its anterior portion. Palate-bones also armed with strong teeth. FINS.—*Br.* 11—12; *P.* 13; *V.* 11; *A.* 12.

\* From an accidental transposition of the labels, the right application of the Indian names to this fish and *Salmo paucidentis* is somewhat doubtful.



## " DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Extreme length . . . . .	31	0	Length from end of snout to anal . . . . .	21	0
Greatest height of body . . . . .	5	9½	" " adipose* . . . . .	21	0
Circumference of ditto . . . . .	14	0	" of pectorals . . . . .	3	4½
Breadth between the eyes . . . . .	2	0	" ventrals . . . . .	3	0
" " nostrils . . . . .	1	2½	" attachment of dorsal . . . . .	3	0
Length from end of snout to nostrils . . . . .	1	2½	Height of dorsal . . . . .	2	4½
" " eyes . . . . .	1	9½	" adipose . . . . .	1	2½
" " angle of opercula . . . . .	5	2½	Length of caudal . . . . .	4	8½
" " pectorals . . . . .	6	3½	Its greatest breadth . . . . .	4	0
" " dorsal . . . . .	12	0	Length of attachment of anal . . . . .	2	4½
" " ventrals . . . . .	12	3½			

GAIRDNER, in lit.

[In this species the gill-cover resembles that of *S. salar* still more strongly than that of the *quinnat* does, the shape of the suboperculum in particular being precisely the same with that of *salar*. The *teeth* stand in bony sockets like those of the *quinnat*, but are scarcely so long. Those of the lower jaw and intermaxillaries are a little smaller than the lingual ones, and somewhat larger than the palatine or labial ones. The tongue contains six teeth on each side, the rows not parallel as in the *quinnat*, but diverging a little posteriorly. The pharyngeals are armed with small sharp teeth. The numbers of the teeth, excluding the small ones which fall off with the gums, are as follow: *Intermax.* 4—4; *labials* 21—21; *lower jaw* 11—11; *palate-bones* 12—12; *vomer* lost; *tongue* 6—6. When the soft parts are entirely removed, the projecting under edge of the articular piece of the lower jaw is acutely serrated, in which respect this species differs from all the others received from Dr. Gairdner. There are sixty-four vertebræ in the spine.—R.]

[84.] 13. SALMO PAUCIDENS. (Richardson.) *Weak-toothed Salmon.*

Quannich. NATIVES of the Banks of the COLUMBIA.

" This salmon ascends the Columbia at the same time with the *S. Gairdnerii*, and in equal numbers. It is taken in company with that species and the *quinnat*, and has an average weight of three or four pounds.

" COLOUR.—Back of head and body bluish-grey; sides ash-grey with a reddish tinge; belly white. No trace of spots on the body or fins. FORM.—Commissure of the mouth very oblique approaching to vertical, dorsal profile quite straight, tail forked. Ventrals corresponding to middle of the dorsal and adipose to posterior extremity of the anal. TEETH sparingly scattered and feeble on the jaws, only a few short weak ones on the anterior extremity of the vomer, and on the palate-bones. FINS.—*Br.* 13; *P.* 17; *V.* 12; *A.* 17; *D.* 12—0.

\* Dr. Gairdner must have accidentally put down wrong figures here in transcribing his notes, as the adipose is not opposite to the commencement of the anal, but to its end.—R.

## " DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Extreme length . . . . .	23	0	Length from end of snout to adipose . . . . .	18	0
Greatest height . . . . .	4	6	"    of pectorals . . . . .	2	8½
Circumference of body . . . . .	11	0	"    ventrals . . . . .	2	2½
Breadth between nostrils . . . . .	1	0	"    attachment of anal . . . . .	2	2½
"    eyes . . . . .	1	8½	Height of ditto . . . . .	1	8½
Length from end of snout to nostrils . . . . .	0	8½	Length of attachment of dorsal . . . . .	2	1
"    "    eyes . . . . .	1	3½	Height of adipose . . . . .	6	9½
"    "    angle of opercule . . . . .	4	6	Extreme length of caudal . . . . .	3	10½
"    "    pectorals . . . . .	5	3½	Its greatest breadth . . . . .	4	2½"
"    "    dorsal . . . . .	10	0			
"    "    ventrals . . . . .	12	0			

GAIRDNER, in *lit.*

[From the labels having dropped off, I cannot refer the fragments of any of the specimens to this species with certainty, but I am inclined to think that a spine, containing sixty-six vertebrae, belongs to it, and if so, the gill-cover is extremely like that of *S. Scouleri* (pl. 93), and the bones of the head have the same fibrous structure which we have noticed in the description of that species. None of the teeth have been preserved, but those of the lower jaw appear to have been fixed in cartilaginous sockets, which have separated from the bone, leaving a rough surface. The palate and upper jaw-bones are lost. The union of the branchial arches at the root of the tongue is longer and narrower than in the preceding two species, and the gill-openings consequently are more ample. Either this species or the *S. Scouleri*, or perhaps both, are named "Red-char" by Lewis and Clarke. See p. 162.—R.]

[62.] 2. SALMO SCOULERI. (Richardson.) *The Ekewan.*

Salmo Scouleri, p. 158. PLATE 93.

"The Ekewan, which averages thirty pounds in weight, ascends the Columbia towards the end of August and in the month of September. Its flesh is paler and of inferior quality to the four preceding kinds." [From Dr. Gairdner's description of this species I have little doubt of its being the same with the *S. Scouleri* of Observatory Inlet (p. 158), and I should without hesitation have referred to it the spinal column and opercular bones noticed at the close of the account of the preceding species, had not Dr. Gairdner mentioned that no specimen of the Ekewan was sent, as he had not obtained one small enough to be put in spirits.—R.]

"COLOUR.—Body above mesial line smoke-grey, passing on head and tail into bluish-grey: a slight reddish tinge at the root of the dorsal and between it and the adipose. Fins bluish-grey, and all tinged with red except the caudal, which, with the back, is studded with irregular semilunar and stellated blackish-brown spots. A large vermilion-red patch in the concavity

of the vertex, and another on the preopercule. Body below the mesial line greyish-white with a reddish tinge. FORM.—A remarkable flattening over extremity of snout, behind which a slight concavity to occiput, where the body rises suddenly into a hump, and continues rising as far as the first dorsal, this elevated portion being acuminate into a ridge: A notch behind the point of the snout gives an arched outline to the commissure of the mouth. Lower jaw also arched upwards, so that the two jaws do not approach each other when the mouth is closed, except at the two extremities. TEETH.—Jaws fully armed with strong hooked teeth, except a small space in the mesial line of the upper jaw. Teeth moveable, from being imbedded in soft cartilaginous sockets. Two rows of strong lingual teeth, a single row on each palate-bone, and a few rudimentary ones can be felt in a single row on the anterior extremity of the vomer. Teeth on the pharyngeal bones. RAYS.—*Br.* 16; *P.* 16; *V.* 9; *A.* 16; *D.* 12—0.

## "DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Extreme length . . . . .	34	0	Length from end of snout to adipose . . . . .	27	0
Greatest height of body . . . . .	9	0	"    of pectorals . . . . .	5	0
Circumference of body . . . . .	21	0	"    ventrals . . . . .	4	0
"    tail at root of caudal . . . . .	7	6	"    attachment of anal . . . . .	4	2½
Breadth between eyes . . . . .	3	6	Height of anal . . . . .	3	0
Length from end of snout to eyes . . . . .	3	9½	Length of attachment of dorsal . . . . .	4	0
"    "    angle of opercule . . . . .	8	6	Height of ditto . . . . .	4	2
"    "    pectorals . . . . .	9	2½	"    adipose . . . . .	2	0
"    "    dorsal . . . . .	16	0	Length of caudal . . . . .	7	0
"    "    ventrals . . . . .	18	0	Breadth of caudal . . . . .	8	0
"    "    anal . . . . .	21	0			

" This description applies to a female—the male differs in the upper jaw being elongated into a proboscis, which projects beyond the lower jaw when the mouth is closed: it is formed of a moveable cartilaginous mass articulated to the extremity of the nasal bones, and is furnished with teeth as well as the rest of the jaw. The lower jaw is narrower and entirely received within the concavity of the upper one when the mouth is shut."—GAIRDNER, *in lit.*

[85.] 14. SALMO TSUPPITCH. — *The Tsuppitch.*

Tsuppitch. NATIVES of the Banks of the COLUMBIA.

" The Tsuppitch ascends the Columbia at the same time with the Ekewan. I counted 1644 ova in the ovary of a female.

" COLOUR.—Back of body and head studded with oval and circular spots: sides and fins, including the caudal, destitute of spots: back mesially bluish-grey passing on the back of the head into blackish-grey, and on the sides into yellowish-grey, with a greenish tinge and silvery-white. General colour of the fins ash-grey. TEETH.—Jaws fully armed with minute sharp teeth, a single row on each palate-bone, a very few on the anterior end of the vomer in a single

series, and a double row on the tongue. FORM.—Head small, exactly conical, terminating in a pointed snout. Commissure of mouth very slightly oblique. Convexity of dorsal profile rising gradually to origin of first dorsal, and declining from thence to the tail. Caudal forked. RAYS.—*Br.* 13; *P.* 13; *V.* 10; *A.* 13; *D.* 12—0.

## "DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Extreme length . . . . .	21	0	Length from end of snout to adipose . . . . .	18	0
Greatest height of body . . . . .	4	9½	" of pectorals . . . . .	2	8½
" circumference of body . . . . .	12	0	" ventrals . . . . .	2	3½
Breadth between the eyes . . . . .	1	9½	" attachment of dorsal . . . . .	2	2½
Length from end of snout to eye . . . . .	1	7½	Height of dorsal . . . . .	2	1½
" " angle of opercula . . . . .	4	8½	" adipose . . . . .	0	10½
" " nape . . . . .	3	0	Length of attachment of anal . . . . .	2	6
" " pectorals . . . . .	5	0	Height of anal . . . . .	1	9½
" " dorsal . . . . .	11	0	Length of caudal . . . . .	3	6
" " ventrals . . . . .	12	0	Greatest breadth of ditto . . . . .	6	2"
" " anal . . . . .	16	0			

GAIRDNER, in *Sit.*

[A spine containing sixty-four vertebræ, and an under jaw with ten curved teeth in each limb, are all the bones that I can with any appearance of correctness refer to this species. The teeth are of equal size with those of *S. Gairdneri*, or perhaps rather larger, and are attached to the jaw-bone through the medium of cartilage.—R.]

[86.] 15. SALMO CLARKII. (Richardson.) *Clarke's Salmon.*

[Dr. Gairdner does not mention the Indian name of this trout, which was caught in the Katpootl, a small tributary of the Columbia, on its right bank. I have therefore named it as a tribute to the memory of Captain Clarke, who notices it in the narrative prepared by him of the proceedings of the Expedition to the Pacific, of which he and Captain Lewis had a joint command, as a dark variety of *Salmon-trout* (see p. 163). In colour this species resembles the *Mykiss* of Kamtschatka, and there is no very material discrepancy in the number of rays in the fins. Vide *Arct. Zool., Intr.*, p. cxxvi.—R.]

" COLOUR.—Back generally brownish purple-red, passing on the sides into ash-grey, and into reddish-white on the belly. Large patches of dark purplish-red on the back. Dorsals and base of the caudal ash-grey, end of caudal pansy-purple. Back, dorsal, and caudal studded with small semilunar spots. A large patch of arterial-red on the opercule and margin of the preopercule. Pectorals, ventrals, and anal greyish-white, tinged with rose-red. TEETH.—Both jaws armed with strong hooked teeth, a single row on each palate-bone, a double row on the anterior half of the vomer and on the tongue. Dorsal profile nearly straight. Ventrals opposite to the middle of the first dorsal. Fissure of mouth oblique. Extremity of caudal nearly even. FINS.—*Br.* 11; *P.* 12; *V.* 8; *A.* 13; *D.* 11—0.

## " DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Extreme length . . . . .	14	0	Length from end of snout to anal . . . . .	10	0
Greatest height of body . . . . .	2	10 $\frac{1}{2}$	" " adipose . . . . .	10	1 $\frac{1}{2}$
" thickness . . . . .	1	6	" of ventrals . . . . .	1	6
Length from end of snout to eye . . . . .	1	1 $\frac{1}{2}$	" attachment of dorsal . . . . .	1	4 $\frac{1}{2}$
" " angle of opercule . . . . .	3	2 $\frac{1}{2}$	" " anal . . . . .	1	3 $\frac{1}{2}$
" " pectorals . . . . .	1	9 $\frac{1}{2}$	" caudal . . . . .	2	0
" " dorsal . . . . .	6	4 $\frac{1}{2}$	Greatest breadth of ditto : . . . . .	2	10 $\frac{1}{2}$ "
" " ventrals . . . . .	7	6			

GARDNER, in *St.*

[There appear to have been two specimens of this species sent to me by Dr. Gairdner. In both the spinal column contains sixty-two vertebræ. The teeth, which are closely set, rather long, slender and acute, and, in the older specimen, considerably curved, are in number as follows: *Intermax.* lost; *labials* 28—30; *palate-bones* 15—17; *vomer* 13, two in front and the others in a single flexuose series, as long as the dental surface of the *palate-bones*; *lower jaw* 13—13; *tongue* 6—6, in two almost parallel rows. The lingual teeth are the largest and most curved, those of the lower jaw are next in size, then follow the *vomerine*, *palatine*, and *labial* teeth, which are equal to each other. The pharyngeal teeth are also proportionally long, and there is an oblong plate, rough with very minute ones, on the isthmus which unites the lower ends of the branchial arches. This space is quite smooth in *S. salar*, in several, if not in all the English trouts, and in *S. quinnat*, *Gairdneri*, and in the imperfect specimen which I have referred to *S. Scouleri*. In the latter the surface of the arches is also quite smooth, but in the *quinnat* and *Gairdneri* minute rough points become visible with a good eye-glass. In all the trouts the compressed rakers have their thin inner edges more or less strongly toothed. In one of the specimens of *S. Clarkii* the spinal column is nine inches long, in the other six.—R.]

[87.] 2. SALMO (MALLOTUS?) PACIFICUS. (Richardson.) *North-west Capelin.*

SUB-GENUS, Mallotus. CUVIER?

"The Indian name of this fish is *Oulachan*. It comes annually in immense shoals into the Columbia about the 23rd of February, but ascends no higher than the Katpootl, a tributary which joins it about sixty miles from its mouth. It keeps close to the bottom of the stream in the day, and is caught only in the night. The instrument used in its capture by the natives is a long stick armed with sharp points, which is plunged into the midst of the shoal, and several are generally transfixed by each stroke. It is the favourite food of the sturgeon, which enters the river at the same time, and never has a better flavour than when it preys on this fish. The *Oulachan* spawns in the different small streams which fall into the

lower part of the Columbia. It is much prized as an article of food by the natives, and arrives opportunely in the interval between the expenditure of their winter stock of dry salmon and the first appearance of the *quinnat* in May." [This fish is noticed by Lewis and Clarke in the following terms. "The anchovy, which the natives call *olthen*, is so delicate a fish that it soon becomes tainted, unless pickled or smoked: the natives run a small stick through the gills, and hang it to dry in the smoke of their lodges, or kindle small fires under it: it needs no previous preparation of gutting, and will be cured in twenty-four hours: the natives do not appear to be very scrupulous about eating it when a little foetid."—R.]

"COLOUR generally silvery-white, passing on the back into a blackish tinge. Large irregular, but generally oval spots of yellowish-white and blackish-grey on the back. A bluish-black spot over each orbit. Margins of lips black. Back of head greyish-white. Minute black dots on the silvery basis of the cheeks. FORM.—*Head* small and pointed. Large sub-orbital covering the greater part of the cheek. Opercule terminating in a thin rounded angle. Mouth opening obliquely upwards, its fissure extending as far back as the anterior margin of the orbit. Lower jaw projecting beyond the upper one, and terminating in a rounded knob turned slightly upwards. Margins of upper jaw entirely formed by the intermaxillaries, on which there are a few minute setæ in place of teeth. Lower jaw, vomer and palatines devoid of teeth. Tongue rough, and pharyngeals armed with teeth. FINS.—*Br.* 8; *P.* 11; *V.* 8; *D.* 11—0; *A.* 20. Adipose fin thin and containing little fat. Lateral line straight and continuous.

## " DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Extreme length . . . . .	7	6	Length from snout to anus . . . . .	4	4½
Breadth between the eyes . . . . .	0	4½	" " adipose . . . . .	5	7½
Height of body . . . . .	1	2½	Distance between back and pectorals . . . . .	0	9½
Length from snout to orbit . . . . .	0	4½	" " belly and ditto . . . . .	0	3½
" " nape . . . . .	0	9½	Length of pectorals . . . . .	0	10½
" " angle of opercule . . . . .	1	4½	" " ventrals . . . . .	0	10½
" " pectorals . . . . .	1	6	" " attachment of dorsal . . . . .	0	7½
" " ventrals . . . . .	3	1½	Height of dorsal . . . . .	0	8½
" " dorsal . . . . .	3	6	Length of attachment of anal . . . . .	1	1½

GAIRDNER, *in lit.*

[Five specimens were sent to me by Dr. Gairdner, but they were unfortunately all so much injured that I can add very few particulars to that gentleman's brief description. In the general form, the appearance of the scales, the black specks on the head and body, the form of the anal and its attachment to a compressed projecting edge of the tail, the structure of the lower jaw and gill-covers, and in the shape of the head as far as it could be ascertained, this fish closely resembles the capelin (p. 187). On the other hand the ascent of the species into fresh water to spawn, and perhaps its dentition, ally it to the smelt (p. 185). *Head* as in the capelin, forming one-fifth of the length between the tip of the snout and end of the central caudal rays. *Caudal* forked. *Dorsal* commencing a very little anterior to the middle between the tip of the snout and end of scales on the caudal, agreeing, in this respect, more nearly with the

smelt than with the capelin, in which the dorsal is farther back, its first ray being equidistant from the end of the snout and the extremity of the central caudal ray. Anal of one specimen containing twenty-one rays. Gill-covers thin, papery, and flexible, lined with nacre. In drying, the surfaces of the opercular-bones are marked with wrinkles parallel to their sides, as may be observed in the smelt and capelin, but not so conspicuously. These wrinkles are most evident on the square operculum. As the thin lining of the mouth and lips is mostly abraded, from the putrescency of the specimens, the dentition can be only imperfectly ascertained from them. In four specimens no teeth whatever can be discovered; but in a fifth, a female full of mature roe, the lower jaw is armed with a single series of very slender, curved teeth, rather more distant, and a little longer than those of the capelin. There is also a solitary tooth remaining on the vomer of the same specimen, occupying the place of the exterior vomerine tooth in the smelt, and nearly as large. Tongue conical as in the smelt, and not presenting an oval flat surface surrounded with teeth like the capelin. In all the specimens the upper jaw was so much injured that its structure could not be ascertained, but it is probable that the intermaxillaries, being small as in the capelin, were not distinguished from the labials by Dr. Gairdner, in his examination of the recent fish. The rakers of the branchiæ are long and slender as in the smelts and capelin. The stomach resembles that of the capelin: the descending portion ends in a pointed sac, and a short branch which it gives off in the middle terminates in the pylorus. The intestine makes a bend, or rather twist, downwards at the pylorus, and runs straight to the anus, its calibre gradually becoming less as it approaches the latter. There are nine cæca, three of them rather shorter than the others close to the pylorus, the other six, inserted in a single series down one side of the intestine, are each half an inch long. In three specimens there are sixty-eight vertebræ in the spine, and in two sixty-nine. A male specimen, with the melt half grown, showed no traces of *villi*, or altered scales, on the lateral-line, though the skin was apparently entire in that place. Male capelins, destitute of the ridges of elongated scales, are occasionally taken in Greenland. (See p. 187.)

## DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from gullet to tip of descending part			Length from pylorus to last cæcum . . . . .	0	6
of stomach . . . . .	1	5	" of rest of gut . . . . .	2	6
" of pyloric branch . . . . .	0	3			R.]

## CLUPEOIDEÆ.

THE members of this family may be at once recognised by their having jaws similar in structure to those of the trouts, but no adipose fin. Their bodies are always very scaly. The greater number possess an air-bladder and numerous cæca. Only some species ascend rivers. The following are indicated in the *Règne Animal* as frequenting the shores of the United States. *Alosa vernalis* (Spring-herring, or Alewife, MITCH.), *A. æstivalis* (Summer-herring, MITCH.), *A. menhaden* (Bony-fish, Hard-heads, or Marsh-bankers, MITCH.), *A. matowaka* (Long Island-herring, MITCH.), *Chatòessus oglina* (*Megalops oglina*, LE SUEUR), *Ch. Cepediana* (*Megalops Cepediana*, LE SUEUR), *Elops Carolina*, *Butirinus vulpes* (CATESBY, t. 1, f. 2), *Hyodon clodalis*, *H. tergisus* (LE SUEUR), *Amia calva*, *Lepisosteus rostratus* (*Esox osseus*, LINN.), and *L. spatula*. Dr. Mitchill mentions in addition to these *Clupea halec*, *pusilla*, *parvula*, *indigena*, *vittata*, *cærulea*, *alosa*, *mediocris*, and *sadina*, the last being an *Engraulis*, and the two which precede it Shads. Dr. Smith gives *Clupea minima* in his list of Massachusetts fish, and M. Rafinesque's uncertain genera of *Pomolobus*, *Dorosoma*, and *Notemigonus*, are founded on Ohio fish, which Cuvier thinks are more or less nearly allied to the *Alosæ*. The *Engraulis encrasicolus* has a place in the *Fauna Grænlantica* of Fabricius, from having been found in the stomachs of seals killed in Davis' Straits far from the shore. All the specimens he saw were much mutilated, and the species therefore must be doubtful.

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[88.] 1. CLUPEA HARENGUS. (Linn.) *The Common herring.*

FAMILY, Clupeoides. GENUS, Clupea. LINN. *Sub-genus*, Clupea. CUVIER.  
*Clupea harengus*. FABRICIUS, *Faun. Grænl.*, p. 182. RICH., *Fr. Journ.*, p. 716.  
 Kapiselik. GREENLANDERS.

In the *herrings* a small portion only of the upper jaw consists of the short, narrow intermaxillaries, its sides, which are alone protractile, being formed by the comparatively long labials; the acute rim of the belly has the scales arranged like the teeth of a saw. The labials are moreover divisible into three pieces, the gill-



openings wide, the branchial rakers long, slender, and closely set, the stomach forms an elongated sac, the cæca are numerous, the air-bladder is long and pointed, and the ribs are more numerous and slender than in other fish. The *True herrings*, constituting the sub-genus *elupea* of Cuvier, have their labials curved anteriorly, and divisible longitudinally, into several pieces, the orifice of the mouth of a middle size, and no notch in the upper lip.

Pennant describes the *Common herring* as so abundant on the coast of Carolina, that the inhabitants fling it ashore by shovels-full, but he at the same time expresses a doubt whether it be of the same species with the European fish of the same name; and it is indeed evident that this is not the case, for he says that it leaves the salt water in March, and runs up the rivers and shallow streams in such numbers that the passengers trample many under foot in crossing the fords. It is not the habit of the *Common herring* to enter fresh waters, but several species of *shad* are known to ascend the American rivers. The *chupea harengus* is, however, included by Schœpf and Dr. J. V. C. Smith in their respective lists of the fish of New York and Massachusetts; and popular writers on the British American colonies have mentioned, without hesitation, its existence in the seas of Newfoundland and Nova Scotia; yet it is not noticed by Dr. Mitchill. Fabricius says it is rare on the Greenland coast and in Davis' Straits, and that it is but of a small size in those seas, its length not exceeding five inches and a half. The herring of the Kamtschatka seas, mentioned in the description of that country, is, if we may judge from its habitually entering rivers, most probably a *shad*\*; but Mr. Collie observed a *chupea*, which he referred to *harengus*, pretty abundant in Awatska Bay; it was of a small size, and had a ventricose belly.

The migrations of the Common herring have been greatly celebrated by ichthyological writers, and the reader will find in Pennant's British Zoology a very circumstantial and highly interesting detail of its hybernation within the arctic circle, and of its issuing thence in the spring in a mighty army †, composed of countless multitudes, the vanguard appearing off the Shetland Islands in April and May, and the main body following in June, when it separates into two wings; one proceeding

\* "The herring, both the common and the variety, found in the Gulf of Bothnia, called *membras*, and by the Swedes *ströeming*, visit these coasts in shoals, perhaps equal to those of Europe. There are two seasons, the first about the end of May, the second in October. The first species are remarkably fine and large; they ascend rivers, and enter the lakes: the autumnal migrants are closed up in them by the shifting of the sand at the mouths of the entrance, and remain confined the whole winter. The natives catch them in summer in nets; and in winter in most amazing numbers, by breaking holes in the ice, into which they drop their nets, then cover the opening with mats, and leave a small hole for one of their companions to peep through and observe the coming of the fish, when they draw up their booty, and string part on packthread for drying; and from the remainder they press an oil white as the butter of Finland."—PENN., *Arct. Zool. Istr.*, p. cxxvi.

† From Pennant we learn the name of the herring is derived from the German word *heer*, signifying an army.

to the westward, supplies the Hebrides, and moving onwards to the north of Ireland divides into two columns, which take different sides of the island; the other wing, seeking the eastern coasts of Britain, and filling every bay and creek in its progress, passes through the English channel, and, like the western phalanx, disappears in the expanse of the Atlantic. The whole of this account is now supposed to be imaginary by naturalists, who assert that the herring fattens in the depths of the ocean, and approaches the shore in shoals merely for the purpose of depositing its spawn. Cuvier, however, says "this celebrated fish quits the northern seas every year in summer, and descends upon the western shores of France in the autumn in numberless legions, or rather in dense shoals of incalculable extent, which spawn by the way, and arrive, greatly attenuated, at the mouth of the channel in the middle of winter. The fattest are those which are taken farthest to the north; when they reach the coast of Lower Normandy they are empty, and their flesh is dry and disagreeable." The herring is unknown in the Mediterranean.

On Sir John Franklin's first expedition we took several individuals of a *clupea* in Bathurst's Inlet, on the 5th of August, 1821, which I supposed to be the *Common herring*. In the absence of specimens I can only subjoin the description which was drawn up on the spot, although it is too general to serve the purpose of identifying the species. In the European herring the teeth on the intermaxillaries and lower jaw are sufficiently conspicuous, but none were perceptible on these bones in the Bathurst Inlet fish, whose characters, as far as noted, agree in all other respects with those of *clupea harengus*.

## DESCRIPTION

Of a recent herring taken in Bathurst's Inlet, August 5, 1821.

FORM.—*Head* conical in profile, its not very acute apex being formed by the tip of the under jaw, which extends about two lines beyond the upper one. *Eyes* large, and situated laterally at an equal distance from the nape and tip of the snout. *Nostrils* a small elliptical opening on each side, lying transversely on the upper surface of the nose, and not visible when the fish is viewed in profile. *Gill-covers* and *sub-orbital* bones covered with nacre. The *intermaxillaries* form about one-fourth of the margin of the upper jaw: the *labials* are broad, and their anterior edge is elliptically curved and minutely serrated or toothed; a process runs behind the narrow limb of the intermaxillary to be articulated to the snout, and there are two other pieces or processes imbedded in the fine membrane that forms the anterior portion of the parietes of the mouth: when the mouth is shut, the labials lie upon the broad limbs of the lower jaw, which are composed of plates having the thinness and nacry appearance of the sub-orbital bones. The narrow, membranous lower lip, which folds over the edge of the lower jaw, is stretched out by the opening of the mouth. The edge of the labials is

finely toothed, and a cluster of minute *teeth* exists on the vomer, but none can be perceived on the intermaxillaries or lower jaw. The *gill-membrane*, thick and nacre, contains eight rays, of which the posterior ones are flat, and the penultimate one ends in a transparent obtuse point.

FINS.—*Br.* 8; *P.* 16; *D.* 19; *V.* 8; *A.* 16.

The *dorsal* commences rather posterior to the middle of the fish, excluding the caudal: its two anterior rays are short, and closely applied to the base of the third, the others are forked. The *ventrals* are small and opposite to the middle of the dorsal. The *anal* is half an inch high anteriorly, and gradually lowers to half that height: its attachment is almost twice as long as the space betwixt it and the caudal. The latter fin is large, cuneiform, and deeply forked.

COLOUR.—The back, when moved in the light, yields various beautiful reflections of green and gold; the belly and sides are white, with pearly lustre and violet reflections, and the sides of the head are deeply tinged with gold-yellow. SCALES readily deciduous, large, thin, and orbicular, possessing much nacre lustre\*.

INTESTINES (but cursorily examined).—*Stomach* forked, the blind side rather longer than the other. A considerable number (between fourteen and twenty?) of long, slender *cæca* surround the pylorus †. *Air-bladder* thickly covered with nacre. *Roe* slightly developed.

		DIMENSIONS.	
		Inches.	Inches.
Total length . . . . .		15	Length of attachment of anal . . . . . 1½
Length of the pectorals . . . . .	1½	„ its longest rays . . . . .	0½
„ attachment of dorsal . . . . .	1½	„ its last ditto . . . . .	0½
„ its longest rays . . . . .	1½	„ space between it and caudal . . . . .	1

[89.] 1. HIODON CHRYSOPSIS. (Richardson.) *The Naccaysh.*

FAMILY, Clupeoides. CUVIER. GENUS, Hiodon. LE SURUR.  
 Hiodon clodalis. RICHARDSON, *Frank. Journ.*, p. 716, excl. syn.  
 Oweespeetcheesee. CREES. Gold-eye, FUR TRADERS. Naccaysh. VOYAGEURS.

This singular and beautiful little fish inhabits the lakes which communicate with the Saskatchewan, in the 53rd and 54th parallels of latitude, but does not approach nearer to Hudson's Bay than Lake Winipeg. In my account of the fish obtained on Sir John Franklin's first expedition, I considered this species to be the same

\* Few of the distinctive characters of the Common herring, enumerated in the *Règne Animal*, are comprehended in the above description:—They are “*La carène du ventre peu marquée, le subopercule coupé en rond; des veines sur le sous-orbitaire, le préopercule et le haut de l'opercule. Ses ventrales naissent sous le milieu de la dorsale, la longueur de sa tête est cinq fois dans sa longueur totale, et en portant en arrière le distance de son museau à sa première dorsale, on atteint le milieu de la caudale. Son anale a seize rayons.*” P. 318.

† Artedi says the *cæca* are sixteen or seventeen in number.

with the *Hiodon clodalis* of the Ohio, described by M. Le Sueur; but a more careful consideration of his figure and description has induced me to give a distinct specific name to the northern fish\*.

The Naccaysh is taken during the summer months only, and in small numbers, in the gill-nets set for other fish. It bites eagerly at an artificial fly or worm, but angling is seldom practised in the fur countries. Its flesh is white, resembling that of the perch in flavour, and excelling it in richness. The want of an adipose fin separates the Naccaysh from the Salmonoidæ, with which it seems, in some respects, to have a greater affinity than with the Clupeoidæ: it differs from both in having only one cæcum.

## DESCRIPTION

Of the recent fish taken at Cumberland House, lat. 54° N., May, 1820.

**FORM.**—*Profile* sub-oval, the belly more curved than the back; tail much narrower than the body, its under margin joining the curve of the belly by a considerable slope which is occupied by the anal fin. *Body* greatly compressed; thickest above the lateral line, and thinning gradually into the very acute even edge of the belly: the back thins off more suddenly, but its ridge is less sharp than the rim of the belly. The *head* likewise is much compressed and has a conical profile, the snout forming an obtuse apex. The vertex is covered with smooth skin, and there is a large scale on each side of the nape. The large *eye* approaches very close to the margin of the mouth. The nostrils are placed above the level of the eye in the triangular space between the orbit and tip of the snout: the membranous border of the anterior opening forms a lid to the posterior one. The whole *cheek* is covered by the nearly circular plate of the infra-orbital bones. *Gill-openings* large; *gill-plate* edged by a narrow, somewhat cartilaginous border. The mouth has a wide orifice which descends obliquely as it

\* The following is M. Le Sueur's character of the genus:—

“**CHAR.** Body as in the genus *Clupea*, but without the carinated abdomen. Tongue supplied by the *os hyoides*, which is furnished with strong teeth. One dorsal fin. Eyes very large.”—“*Body* compressed as in the herrings, but without abdominal serratures. *Head* narrow; snout very short, obtuse, without scales; posterior sub-orbits covering the cheeks, anterior ones concealing the maxillaries; preoperculum large, triangular, curving under the throat, its posterior angle rounded, covering almost the whole of the suboperculum; the interoperculum very small, squamiform; operculum large, rounded, having a notch in its upper part. *Eyes* very large, situated near the end of the snout, and nearly occupying the space between the summit of the head and the angle of the mouth; they are furnished with a gelatinous, nictitating membrane, which extends on a part of the operculum. *Nostrils* double, placed at the end of the snout, above and near the intermaxillaries. *Mouth* of a middling size, jaws sub-equal; intermaxillaries short, articulated with the maxillaries, both very narrow. *Teeth* conic, equal, close set, in a single row on the maxillaries and intermaxillaries; stronger and in several rows on the lower jaw; very fine on the palate; the vomer equally furnished with several ranges of very strong ones on its whole length. *Tongue* supplied by the *os hyoides*, which is armed with two principal rows of very strong, bent, conic teeth, between which there are several rows of very small teeth. *Branchiostegous rays* short, superior ones enlarged at their extremities, of the number of eight or nine; branchial arch furnished on each side, anteriorly with denticulations (rakers) which interlock one with the other. *Air-bladder* long, compressed; two small globular air-vessels placed each in a cavity under and on each side of the cavity of the cranium: these appear to enable the fish to rise with facility to the surface of the water to take its prey. It was not ascertained whether they communicated with the bladder or not. *Fins*: a single dorsal, placed opposite to the commencement of the anal; pectoral placed low, near the opercula: ventrals midway between the pectorals and anal. *Scales* large, pellucid at the edges, easily deciduous.” LE SUEUR, *l. c.*

runs backwards. The *intermaxillaries* and *labials* form nearly equal portions of the upper jaw: the former are almost immovable, but the ends of the latter are thrust forward a little as the mouth opens. *Lower jaw* strong.

**TEETH** conical, in a single row on the intermaxillaries and labials, those on the former being considerably the largest: there are two rows having their points inclined backwards on the lower jaw, with an intervening narrow bony surface covered with minute teeth. The *vomer* projects from the roof of the mouth and is armed like the lower jaw. The *palate-bones* are rough with minute teeth. The *tongue* is furnished on its margins with hooked teeth which are the largest of all, and its centre is occupied by a crowd of small curved ones ("*dents en carde*"). Club-shaped cartilaginous *rakers*, rough with teeth, stand in double rows on the anterior edges of the branchial arches; and at the union of the arches, both above and below, there are thin plates covered with small teeth. The thick *gill-membranes* contain nine small cylindrical rays: the left membrane overlaps the right one at their insertion into the isthmus.

**FINS.**—*Br.* 9; *P.* 12; *V.* 7; *A.* 34; *D.* 11; *C.*

The first ray of the *pectorals* is considerably stronger than the others. The *ventrals*, situated half way between the pectorals and anus, are small and contain seven rays, which support a delicate membrane. The *anal*, occupying the whole of the upper slope behind the anus, contains thirty-four rays, which become successively shorter as they are more posterior: the edge of the fin is slightly waved. The small *dorsal*, opposed to the anal, contains eleven rays. The *caudal* is crescentic, its lower lobe being rather the largest.

**SCALES** irregularly orbicular and large, being about half an inch in diameter; when *in situ* they have a bluish-grey colour at the base with bright silvery tips. The *irides* and *sides of the head* are tinged with honey-yellow. The *lateral line* is straight till it passes the dorsal fin, when it is slightly deflected.

**INTESTINES.**—The *oesophagus* is distinguished by its more delicate and whiter internal folds from the *stomach*, which is a long tube that makes a curve at its fundus, and has its lining disposed in nine or ten longitudinal folds of a reddish colour: its pyloric orifice is much contracted. Immediately below the pylorus the intestinal canal dilates considerably, after which it forms a tube of equal diameter throughout, and nine inches long, without any distinct rectum: its lining is villous and destitute of *valvulæ conniventes*. An obtuse *cæcum*, three-quarters of an inch long, opens into one side of the dilated intestine next the pylorus, and the gall-duct into the other side. The thin *fæces* of the lower intestine have a honey-yellow colour. The alimentary canal makes one convolution in its course from the *oesophagus* to the anus. The oblong *liver* lies mostly on the right side, there being merely a small lobe on the left: it has a reddish-orange colour. There are two small *spleens*. The *air-bladder* is capacious and communicates with the *oesophagus*. The *kidneys* are bluish-grey, thickly studded with dark brown specks. The lining of the abdomen is of a pearly hue, and the *roe* pure white.

DIMENSIONS.

	Inches.
Length, exclusive of the caudal fin . . . . .	14
„ from tip of the snout to anus . . . . .	9
Greatest depth of the body . . . . .	4½

OBSERVATION.—The *hiodon clodalis*, obtained by M. Le Sueur at Pittsburgh, on the Ohio, differs from the preceding, according to his description and figure, in the snout being manifestly shorter than the lower jaw, in the smaller depth of the body and less-arched belly, in the lateral line being slightly curved before the dorsal, and not deflected posteriorly, and in the number of the rays of the fins, which are as follow: *P.* 13; *V.* 7; *A.* 30; *D.* 15. M. Le Sueur thinks it possible that the *hiodon clodalis* may be the same species with the *tergisus* described below, the notched fin being merely a sexual difference. My description of the *naccaysh* was drawn up at Cumberland House before I had seen M. Le Sueur's account of the genus, and I have had no opportunity since of examining specimens from the United States, otherwise I might have been able to point out the distinctive characters more clearly.

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[90.] 2. HIODON TERGISUS. (Le Sueur.) *Notch-finned Hiodon.*

*Hiodon tergisus.* LE SUEUR, *Journ. Ac. Sc. Phil.*, i., p. 366. An. 1817.  
 Fresh-water herring. UNITED STATES, *apud vulgos.*

This species was found by M. Le Sueur at Buffalo, on Lake Erie, and by Mr. T. Say at Pittsburgh, on the Ohio. M. Le Sueur gives the following description of it:—

“SPEC. CHAR. *Anal fin* large and rounded on its anterior part, very narrow on its posterior part, notched in the middle.”—“COLOUR of the gill-covers golden, eyes brown and golden, back bluish, sides silvery, and fins yellow with metallic reflections on the rays.

“FORM.—Body lengthened, elevated; back almost straight and parallel to the abdomen; tail narrow. Lateral line slight, arched towards the back. *Dorsal* subquadrangular, elevated on its anterior part, the three first rays simple, the last double, the intermediate ones divided. *Pectorals* falciform, pointed, placed horizontally in a longitudinal depression. *Ventrals* large, somewhat rounded at their points, and furnished with a squamiform appendage at their base. *Anal* long, with pretty strong divided rays, the last one double, the three first simple. *Caudal* forked, lobes pointed, equal. RAYS.—*Br.* 9; *P.* 13; *V.* 7; *A.* 32; *D.* 15; *C.* 18½. Length thirteen inches.”—LE SUEUR, *l. c.*

[85.] 1. *AMIA OCELLICAUDA*. (Richardson.) *Marsh-fish*.

Poisson de marais. CANADIANS.

The genus *Amia* stands next in the *Règne Animal* to *Erythrinus*, which it is said to resemble in the jaws and teeth, the hard osseous plates that cover the head, the large scales, and flat gill-rays\*, which are, however, twelve in number. Between the limbs of the lower jaw there is a kind of osseous shield, which exists also, though but in a rudimentary form, in *megalops* and *elops*. Behind the conical teeth there are others like small paving stones, and the dorsal, which commences between the pectorals and ventrals, extends nearly to the caudal: the anal, on the contrary, is short. The nostrils have each a little tubular appendage. The stomach is capacious and fleshy, the gut wide and strong, without cæca, and, what is remarkable, the air-bladder is cellular like the lung of a reptile. Only one species, the *amia calva*, has been hitherto described; it feeds upon craw-fish, and inhabits the rivers of Carolina, probably not ranging far north, as it does not occur in the published lists of the New York or Massachusetts fish.

Mr. Todd sent me a notice of a Lake Huron fish, named locally *Poisson de marais*. It is speared by the Indians in the rushy shallows which it frequents, but is seldom eaten by the settlers. A specimen which Mr. Todd prepared, being unfortunately destroyed by vermin, never reached me, but his short description corresponds with the characters of the genus *Amia*, though the gill-rays are fewer than in the Carolina species.

"*Poisson de marais*—Order, ABDOMINALES."—"Back and sides dark, belly and fins dark green. *Head* short, flattened at top and on the sides; eyes small; jaws even; mouth capacious; tongue obtuse. Two short *cirrho* on the upper lip, the lower lip notched. One row of sharp longer *teeth* on the margin of the jaws, more interiorly shorter clustered ones; two patches of teeth on the upper part of the gullet. *Pectorals* near the throat. *Ventrals* about the middle of the fish. One *anal*. One *dorsal* extending from four inches behind the neck to the *tail*, which is oblong and round, with an irregular round spot of the size of a shilling, bordered with scarlet at the base of the seven upper caudal rays. *Scales* large, semicircular, and membranaceous exteriorly; square where inserted into the skin. The *intestines* make three longitudinal turns in the abdomen. *Rays*.—*Br.* 8; *P.* 17; *V.* 7; *A.* 9; *D.* 48; *C.* 22." TODD, *in lit.*

\* "The *Erythrini*, like the rest of the *Clupeoidea*, have small intermaxillaries, the greater part of the sides of the upper jaw being formed by the labials; a row of conical teeth occupies the margin of the jaws, and anteriorly there are some large ones mixed with the others. Each palate-bone is furnished with two plates of teeth like velvet-pile; and there are five broad gill-rays."—*Règne Animal*.

[86.] 1. LEPISOSTEUS HURONENSIS. *Northern Mailed-fish.*

FAMILY, Clupeoides. GENUS, Lepisosteus. LACÉPÈDE, CUVIER.

In this genus the intermaxillaries, labials, and palate-bones, united to the vomer and ethmoid, form a long snout, the under jaw is equally long, and the whole interior surfaces of both are rough like a file with minute teeth, their margins being armed with long pointed ones. The gill-covers are joined on the throat by a common membrane, which is supported on each side by three rays. The body is invested with scales of a stony hardness; the dorsal and anal are opposite to each other and far back. The two exterior rays of the caudal, and the anterior ones of the other fins, are furnished with scales whose projecting edges produce serratures. The stomach is continuous with a slender intestine which makes two folds and has many pyloric cæca. The air-bladder, which is cellular as in *Amia*, extends the whole length of the abdomen. The *Lepisosteii* acquire a large size, and their flesh forms an agreeable article of diet. They abound in the rivers and lakes of the warmer parts of America.—*Règne Animal.*

The *Northern Mailed-fish* inhabits Lake Huron, where it is speared by the natives in the marshy inlets during the summer season. It also exists in Lake Ontario, from whence a specimen, now in the York Museum, was brought by Captain C. Dalton. La Hontan mentions it in the following terms: “*Le Poisson armé est de trois pieds et demi de longueur ou environ; il a des écailles si fortes et si dures qu’il est impossible qu’aucun autre poisson puisse l’offenser; ses ennemis sont les Truites et les Brochets, mais il sait très-bien se défendre contre leur attaque par le moyen de son bec pointu qui a un pied de longueur\*, et qui est aussi dur que sa peau. Il est délicat, et sa chair est aussi ferme que blanche.*” The safety of this fish depends more on its defensive than on its offensive armour, for, notwithstanding the power ascribed to its beak by La Hontan, its jaws are too feeble to enable it to assail a large trout or pike with advantage. The general resemblance of its bill to the muzzle of a *gavial* is very striking, and it is probable that, like that animal, it retains its prey in its jaws till life is extinguished. The under jaw being, however, articulated before the orbit, where there is no space for a strong muscular apparatus, it cannot, like the crocodiles, whose under jaw is pro-

\* An individual three feet and a half long would have the head and bill together a foot long, if proportional to our specimen.



longed behind the cranium, master animals capable of making strong efforts to escape. A specimen of the Northern Mailed-fish, which was prepared for me by Mr. Todd, at Penetanguishene, having been sent to Cuvier, was returned with the following remark, "*Esox osseus*, LINN. *Lepisosteus rostratus*, NOB.;" but M. Agassiz, who has studied this genus of fishes with great diligence, in connexion with the closely-allied fossil tribes, is of opinion that the Lake Huron *Lepisosteus* is a distinct species from the more southern one described by Linnæus, and Mr. Gray has kindly supplied me with a note of the specific peculiarities which he drew up at M. Agassiz's request.

## DESCRIPTION

Of a dried specimen from Penetanguishene, on Lake Huron.

**FORM.**—*Body* elongated, roundish, fusiform, slightly flattened on the back, belly, and sides; deepest at the ventrals, where its vertical diameter exceeds its thickness by about a ninth part. In *profile* the back is slightly arched. *Head* four-sided, its breadth greater by one-third than the height of the gill-covers: it is even and flat above and on the sides, which taper gradually into a narrow beak, more than twice the length of the rest of the head. The whole surface of the head and bill is bony, finely furrowed and granulated, except the gill-membrane, and its prolongation forwards between the limbs of the lower jaw: the sutures of the bones are very evident. *Orbits* circular, situated close to the articulation of the lower jaw, and thrice their own diameter from the edge of the gill-plates. *Nostrils* close to the end of the bill, the posterior orifices on the dorsal aspect, the anterior ones lateral. *Cheeks* altogether behind the orbit, covered by about twenty polygonal plates, resembling the rest of the surface of the head, and concealing the preoperculum and infra-orbital bones. Edge of the *gill-cover* semi-oval: *suboperculum* and *operculum* nearly of equal size: *interoperculum* larger than either and nearly as broad. *Bill* flat, or very slightly rounded on its upper surface, which is formed by the *ethmoid* bone bordered on each side by the long narrow *labials*, the blunt tip being composed of the small *intermaxillaries* that are attached to the end of these bones. The *under jaw* equals the labials in length, and its rounded tip shuts in behind the intermaxillaries, so that even the nostrils project beyond the mouth: the posterior limbs of the lower jaw expand vertically, rising nearly as high as the upper margin of the orbit. *Tongue* long and narrow, regularly wrinkled transversely with a median line in the dried specimen.

**TEETH.**—There are two contiguous rows of straight, subulate, very acute teeth on the labials, intermaxillaries, and under jaw: those composing the outer row being unequal in size, though small and densely crowded; the interior ones are distant and all about two lines long. The vomer, palate-bones, and inner surface of the lower jaw are covered by multitudes of very minute teeth, which are bounded on each side by an even row a little taller than the others.

**SCALES.**—The body is covered with strong thick scales, which look as if composed of enamel, but are not quite so hard, as they yield slightly to the knife. They are thickened in the

middle, and have a nearly rhomboidal outline, with two processes at the base which are concealed by the overlying scale. The median line of the back is marked by a row of rather broader scales, having a semicircular or heart-shaped edge. From this line the rows of scales descend obliquely down the sides in curves, resembling a reversed italic  $\searrow$ . A very narrow depression of the upper edge of each scale, including the two processes mentioned above, is the whole of its surface that is covered by the superior scale when *in situ*; near the tail the uncovered portion of a scale is a very acute rhomboid, but towards the head its outline is more nearly rectangular, with one slightly convex edge. The surfaces of the scales covering the forepart of the back are coarsely grooved in a radiated manner. The scales on the sides are five lines long by three and a half wide, and a linear inch measured along the oblique rows includes four of them; but when measured along the lateral line, or in the axis of the back, it extends to three and a quarter: there are sixty-five on the lateral line. The termination of the scales on the caudal forms an oblique curved line like the letter *f*, which crosses the direction of the rows at a right angle, the scales extending farthest back on the uppermost part of the fin. The exterior rays of the caudal, and the first rays of the other fins, are armed with a double row of tiled, tapering scales, ending in short spinous points which, being very acute and brittle, are capable of producing dangerous wounds. All the rays of the fins are likewise studded with minute bristles. *Lateral line* nearly straight, marked by a clear line traversing the axis of each scale with a pore in the centre.

FINS.—*Br.* 3—3; *D.* 7; *P.* 15; *V.* 6; *A.* 8; *C.* 13.

The *dorsal* commences opposite to the two last rays of the *anal*, and is rather smaller than that fin. The *ventrals* are attached exactly in the middle between the extremities of the bill and *caudal*. The latter is rounded at the end, and its rays are twice or thrice divided down to their middles.

COLOUR of the head a light green; of the fins yellowish with roundish black spots half an inch in diameter. There are also some black spots on the posterior part of the body and tail. The scales have the light, bluish, semitransparent hue of enamel. The mucus or epidermis, which has dried on their margins, gives many of them the appearance of being serrated.

DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from end of bill to tip of caudal	. 28	0	Length of attachment of anal	. 1	3½
" " end of scales on lateral line	. 25	0	" its longest rays	. 2	3½
" " dorsal	. 21	3	" caudal (middle rays)	. 3	0
" " anus	. 20	0	" ditto upper rays from scales	. 1	9
" " ventrals	. 13	8	" ditto lower rays	. 2	9
" " edge of gill-plate	. 7	8	Depth of body	. 2	3
" " nape	. 7	0	" head at the nape	. 1	4
" " orbit	. 5	3½	Width of middle of body	. 2	0
" of intermaxillaries	. 0	2½	" occiput	. 1	2
" labials	. 4	6	" head between surfaces of the oper-		
" lower jaw	. 5	2	cula	. 1	6
" pectorals	. 2	0	" between the orbits	. 1	0
" ventrals	. 2	3	" of bill at extremities of labials	. 0	4½
" attachment of dorsal	. 1	2¼			
" its longest rays	. 2	3			

The following is Mr. Gray's notice of the species :—

" *LEPISOSTEUS HURONENSIS*. *Jaws* elongate, slender, with a series of close, small, acute teeth on the outer edge, and a row of rather distant, larger, elongated, conical, acute teeth, just within their edge, and within them there is a narrow band of very short, small, velvet-like teeth, which is contracted to a single series in front. Middle of the palate minutely granular behind, with smaller velvet-like teeth in front. *Head* and *operculum* granular. *Body* pale yellowish (under the epidermis white), with some large black spots on the tail and caudal fin. *Scales* rhombic, smooth, with a sub-central, longitudinal convexity, which is sometimes produced into a very slight descending process at the hinder part of the lower edge, the margins entire, the lower edge arched. The vertebral series rather larger, generally sub-cordate, with a slight central groove and a posterior notch. *Lateral line* rather indistinct. The first ray of all the fins and sides of the tail furnished with a series of elongated, sub-cylindrical scales, their acute, spine-like tips rather recurved."—" This species is allied to *Lepisosteus osseus*, BLOCH, t. 390, and to a new species which M. Agassiz has lately described from two specimens in the collection of the British Museum, under the name of *Lepisosteus gracilis* (*Proc. Zool. Soc.*, 1834), in the form of the beak, and is intermediate between them in the slenderness and comparative length of that part, as the following measurements will show.

	<i>L. osseus.</i>	<i>L. Huron.</i>	<i>L. gracilis.</i>
	Inches.	Inches.	Inches.
" Length of the whole fish . . . . .	35½	28	11
" upper jaw . . . . .	6½	4½	2½
" head . . . . .	11	7½	3½
" lower jaw . . . . .	7	5	2½
" from tip of nose to front of ventrals . . . . .	18½	13½	5½
" " anal . . . . .	27	20½	8½
" " dorsal . . . . .	28½	21½	8½

" *Lepisosteus Huronensis* differs from the other two in the scales being quite smooth ; while in *L. osseus* the scales of the front of the body are slightly radiately grooved, and their edges are crenulated ; and in *L. gracilis* the disk of the scales is rather granulated, their margin smooth and entire. It also differs from both these, and from all the other known species of the genus, in being spotted. The three long-nosed species are easily distinguished from each other by their dentition, for *L. gracilis* has a series of long, rather distant teeth on the roof of the mouth, on each side, within the two thin velvet-like bands. *L. osseus*, on the contrary, has no such rows in that place, but the whole hinder part of the roof of the mouth is covered with rather large, short, conical teeth behind the two marginal velvet-like bands." J. E. GRAY, *in lit.*

## MALACOPTERYGII SUB-BRACHIATI.

## GADOIDEÆ.

THE third order of fish in Cuvier's arrangement is named *Jugular*, from the forward position of the ventrals under the pectorals, and comprehends all the soft-finned fish which have the pelvis attached directly to the humeral bones. It includes the Linnean genera *gadus*, *pleuronectes*, *cyclopterus*, and *echeneis*, which are raised to the rank of families in the *Règne Animal*.—The *Gadoideæ* are most abundant in the northern seas, some species being plentiful in the highest latitudes to which navigators have penetrated, but few, comparatively, are known to exist within or near the tropics. Most of the family are agreeable articles of food, and their capture finds employment for myriads of fishermen, and investment for a very large capital. A large portion of the *Gadoideæ* are mentioned by authors as common to both sides of the North Atlantic, and even to the Icy Sea and sea of Kamtschatka; but there is much reason to believe that the specific identity of fish of this family, inhabiting distant localities, has been very often inferred from a recollection of the general resemblance of the type, rather than from an actual comparison of the specimens. The lists furnished by Fabricius and the ichthyologists of the United States seem particularly to require revision. The following have been mentioned as frequenting the coast of the latter country, but I think it probable that several of them are different from the European species whose names they now bear. MORRHUÆ.—*Gadus morrhua*, Bank cod, PENN., MITCHILL; *G. callarias*, Dorse, common cod of New York, MITCHILL; *G. rupestris*, Rock-cod, SMITH (*G. callarias*, var. MITCH.); *G. arenosus*, Shoal-cod, SMITH; (*G. callarias*, var. MITCH.); *G. tomcod*, SCHOEPF (*G. tomcodus*, MITCHILL); *G. æglefinus*, PENN., MITCH.; *G. fasciatus*, Frost-fish, PENN. (*G. fuscus*, SMITH, *G. tomcodus*, *pruinus*, MITCHILL); *G. blennoides*, Blennoid cod, MITCH. MERLANGI.—*Merlangus vulgaris*, Whiting, SMITH; *Gadus albidus*, New York Whiting, MITCHILL; *Gadus purpureus*, New York Pollack, MITCHILL; *Merlangus pollachius*, Pollock, SMITH. MERLUCCII.—*Gadus merluccius*, Hake, MITCH., SMITH. LOTÆ.—*Gadus maculosus* vel *maculosa*, LE SUEUR; *G. compressus* vel *Molva Huntia*, LE SUEUR. BROSMII.—*Brosmius vulgaris*, Cusk, SMITH.

PHYCIDES.—*Gadus tenuis*, Slender cod, MITCH.; *G. punctatus*, Spotted cod, MITCH.; *Blennius chuss*, SCHOEPP, *Encheliopus Americanus*, SCHN., *Gadus longipes*, MITCH.; *Raniceps blennoides*, Garter fish, SMITH.

Tilesius mentions *gadus macrocephalus*, *gracilis*, *morrhua*, and *luscus*, as inhabitants of the seas of Kamtschatka, but the members of this family that frequent the north-west coast of America are almost totally unknown. Dixon informs us that he took hake in Norfolk Sound, which proves nothing more than that the fish which he so calls resembles a *merluccius*.

[93.] 1. GADUS MORRHUA. (Auct.) *Common Cod-fish.*

FAMILY, Gadoideæ. CUV. GENUS, *Gadus*. LINN. *Sub-genus*, *Morrhua*. CUV.  
*Morrhua vulgaris* (maxima asellorum species). BELON, p. 121. An. 1551.  
*Gadus dorso tripterygio*, ore cirtato, cauda æquali fere cum radio primo spinoso. ARTEDI.  
*Gadus morrhua*. FABRIC., *Fauna Grænl.*, p. 146, No. 102. MITCH., *Fish of New York*,  
 i., p. 367, No. 1. SMITH, *An. of Massach.*, p. 16. An. 1835. ROSS, Captain J. C.,  
*App.*, p. xlvi. An. 1835.  
 Common Cod. PENN., *Arct. Zool.*, ii., p. 114, *Suppl.*, No. 87.  
 Saraudliksok, or Ekalluarksoak. GREENLANDERS. Keeling. SCOTS.

The sub-genus *Morrhua* is characterised by the presence of three dorsals, two anals, and a barbel at the extremity of the lower jaw. It contains many species. The Common cod-fish is probably an inhabitant of all the northern seas, down to the 41st parallel. It abounds in the North Atlantic, where it frequents sand-banks lying from twenty to eighty fathoms under water. Pennant is of opinion that its proper range is between the 66th and 50th parallels of latitude, those caught north and south of these degrees being either few in quantity or bad in quality. "The great rendezvous," says he, "of the cod-fish is on the banks which lie off the coasts of Newfoundland, Cape Breton, Nova Scotia, and New England; few are taken north of Iceland, but on the south and west coast they abound, and they again swarm off Norway, in the Baltic, and off the Orkneys and Hebrides." It does not exist in the Mediterranean. Dr. Mitchill states the *callarias* to be the Common cod of New York, while the *morrhua*, or "Bank cod" as he calls it, is brought to the market of that city from Nantucket, and the coast beyond, between November and April only, the summer temperature of the United States' waters being, in his opinion, sufficient to kill it. Cod-fish, of excellent quality, are found in the estuary of the St. Lawrence, pretty high up. Fabricius says that the *morrhua* is less common on the Greenland coast than the *callarias*; but Captain James

C. Ross informs us, that on the west coast of Greenland, in latitude  $66\frac{1}{2}^{\circ}$  N., a number of very fine cod-fish were caught by the crew of the *Victory*, on a bank consisting of small stones, coarse sand, and broken shells, with from eighteen to thirty fathoms of water over it. He adds that there are several other banks of considerable extent on that coast, some of them in the vicinity of the Danish colonies, where the cod-fish assemble in astonishing numbers. This fish is also found on the American side of the Greenland seas, for Davis observed many in possession of the Esquimaux who inhabit the land between Cape Raleigh and Cumberland Strait, and the following passage occurs in the narrative of his third voyage, when embarking in the *Moonshine* of thirty-five tons, he ran to the southward from latitude  $67^{\circ}$ , across the entrance of Hudson's Strait, to  $57^{\circ}$  on the Labrador coast. "Coasting the shore towards the south, we saw an incredible number of birds: having divers fishermen aboard our barke, they all concluded that there was a great skull of fish: we being unprovided of fishing furniture, with a long spike nayle made a hooke and fastened the same to one of our sounding lines: before the baite was changed we took more than fortie great cods, the fish swimming so abundantly thicke about our barke as is incredible to bee reported, of which, with a small portion of salt that we had, we preserved some thirtie couple, or thereabouts, and so returned for England." (Hakluyt, iii., p. 120.)

Small cod-fish, resembling the rock-cod of the British coast, were purchased by Captain James C. Ross from a party of Esquimaux, who were fishing for them through holes in the ice on the west side of the peninsula of Boothia, and he was told that in the autumn full-sized ones were taken farther to the westward\*. The Common cod, or a variety of it, is mentioned by Tilesius as inhabiting the sea of Ochotsk, but I have met with no account of its having been detected on the American side of the Pacific. The food of the cod-fish is very various, consisting of all kinds of fish that inhabit the banks it resorts to, molluscæ, both soft and shelly, crustaceæ, and marine insects. The baits most generally used on the banks of Newfoundland are capelin and cuttle-fish. At certain seasons the stomachs of the cod brought to the London market are filled with young muscles. For an account of the important fisheries which have been established for the capture of the cod, the reader may consult Du Hamel, Pennant, or the several Encyclopedias which are daily issuing from the press. The cod-fish evidently derives its English name from its softness, flaccidity, and shape, the word cod (Saxon *codde*) still being in common use in Scotland to signify a bag or pillow.

\* This fish was termed by the Esquimaux *cook*.

Not having access to any variety of specimens of American cod-fish, I shall not attempt to give a detailed description of the species. A specimen brought from Newfoundland by Mr. Audubon, to whom it was given by the fishermen as an uncommon kind or variety, does not appear to differ from the small brown cod which is taken on rocky parts of the British coast.

Its length is sixteen inches, the head forming one-third part, and the central rays of the square caudal fin measuring an inch and a quarter. The lateral line is arched anteriorly, descending at the second dorsal, and then running straight to the tail, keeping rather nearer to the anal than to the dorsal in its course. The teeth of the upper jaw and vomer are acute, of various lengths, and crowded into bands: or the lower jaw they stand almost in a single series.

FINS.—*Br.* 7—7; *P.* 18; *V.* 6; *D.* 15—19—17; *A.* 19—17; *C.* ——. *Newf. sp.*  
7—7; 18; 6; 14—20—17; 19—20; 38 to 40. *Dav. St. sp.*

The number of rays of the Davis' Straits' fish are quoted from Captain James C. Ross, who says that the average weight of fifteen individuals was sixteen pounds, and their length thirty-six inches and a half, of which the head formed one-fourth part, and the caudal fin one-seventh. Though the number of rays was various in different specimens, the second dorsal always contained more than either the first or third. The alimentary canal rather exceeded the body in length, and the pyloric cæca amounted to two hundred and fifty.

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[94.] 2. *GADUS CALLARIAS.* (Linn.) *The Dorse.*

*Gadus callarias.* FABRICIUS, *Fauna Grænl.*, p. 144.

*Gadus callarias.* ROSS, *App.*, p. 1.

SARAUDEEK. GREENLANDERS. Ekeetok. *Esquimaux of Boothia.*

The *Dorse* is mentioned by Fabricius as common on the Greenland coast, and Captain James C. Ross observed it in the inlet to the west of the peninsula of Boothia, where it is taken abundantly, though in very poor condition, by the Esquimaux, who fish for it from the middle of May till near the end of June, through holes cut in the ice. It is plentiful in the White Sea and along the whole northern coast of Europe, particularly in the Baltic. Fabricius states that on the Greenland coast it feeds upon small fishes, crustaceæ, and molluscæ, and that it is most frequently observed at some distance from the bottom, with its tail directed obliquely downwards. A smaller variety, differing from the larger one in the number of rays of the fins, is taken in some places only, in the winter time, under the ice. The *callarias* of Dr. Mitchill is probably a distinct species.

Those that Captain James Ross saw on the coast of Boothia seldom exceeded fourteen inches in length, though a few were obtained of greater size. They were provided with forty-two pyloric cæca, and the average number of rays in their fins were as follows.

FINS.—*Br.* 7; *P.* 19; *V.* 6; *D.* 12—19—23; *A.* 22—22; *C.* 40 to 44. Ross.  
 7; 20; 6; 14—19—19; 21—19; 40. *Faun. Græn., lar. var.*  
 7; 19; 6; 13—24—18; 22—18: 44. *Ditto, small ditto.*

## DIMENSIONS

Of a specimen taken on the coast of Boothia.

	Inches.	Lines.		Inches.	Lines.
Length from tip of snout to end of caudal	17	3½	Length of central caudal rays	1	2½
" " anus	8	7½	" barbel on lower jaw	0	8½
" " edge of gill-cover	4	6	" longer cæca	1	6

Captain J. C. Ross.

[95.]

GADUS FABRICII. *The Meesarkornak.*

*Gadus æglefinus.* FABRICIUS, *Faun. Græn.*, p. 142. No. 100.  
*Meesarkornak, eekallook.* GREENLANDERS.

Fabricius considers this fish to be the *Gadus æglefinus* of authors, the *haddock* or *haddy* so abundant in the Scottish firths. The haddock is vulgarly supposed to have been the fish out of whose mouth St. Peter took the tribute-money, the black marks at the pectorals being considered to be the impressions left by the saint's finger and thumb, which the species has retained ever since. The same honourable origin is commonly ascribed to the black lateral spot on the body of the Dory, but superstition has entirely overlooked the fact, that neither that fish nor the haddock exist in the sea of Gennesaret, whose waters are perfectly fresh. As Fabricius seems to have identified the *Meesarkornak* with the haddock, solely from its agreement with Artedi's very brief notice of the latter, and as it does not possess the distinguishing marks at the pectorals, I have ventured to name it as a distinct species, considering the addition of another synonym, even should it prove to be unnecessary, as less injurious to the interests of science, than the error of ascribing to a fish too wide a geographical range, or habits which do not belong to it. The *Meesarkornak* frequents the northern bays of Greenland pretty abundantly in the winter season, spawns on the littoral sea-weeds in February, and of course under the ice, and is of so curious a disposition that it is readily attracted to the surface by agitating the water, especially in the evening. Sometimes it leaps upon the ice, when it becomes the prey of the Arctic fox, which lies in wait for such a chance,



and is even said to know how to bring about this desired event, by stirring the water with his foot through a crevice. The Greenlanders take it in a similar way with their hands, having learnt the art, according to Fabricius, from the fox.

The species attains the length of fourteen inches. The colour of the back is soiled or livid white, the sides are minutely spotted with black, and the under parts are pure white. There is a short barbel under the chin.

FINS.—*Br.* 6; *D.* 13—15—23; *P.* 19; *V.* 6; *A.* 17—20; *C.* 32. *Fauna Grænl.*

[96.] 4. GADUS OGAC. — *The Ogak.*

Gadus barbatus. FABRICIUS, *Faun. Grænl.*, p. 146.

Ogak, or Owak. (*The young ogarak, or owarak, pl. ogarkæt, or owarkæt.*) GREENLANDERS.

This is a larger species than the *Whiting-pout* of the English seas, to which Fabricius refers it, and it wants the black spot at the base of the pectorals: a new specific appellation is therefore as much required as in the case of the preceding species. As the Esquimaux of the peninsula of Boothia call the *rock-codling* (p. 324), which they take near Cape Isabella, by the same name which the Greenlanders apply to this, viz., *owak*, or *owuk*, it is probable that they nearly resemble each other, if they are not specifically the same.

The *ogak* is described by Fabricius as rarely exceeding eighteen inches in length and five in depth, and as corresponding with the description given by Artedi (sp. 65), except in wanting the dark spots at the base of the pectorals. It lives among sea-weeds in deep, shady places, in company with the *Cottus Grælandicus*, where it feeds upon capelin, blennies, launces, and other small fish, as well as upon crustaceæ. It spawns among the sea-weeds in February or March, while the ice is as yet entire, and in June multitudes of its young, no bigger than sticklebacks, may be seen along the shore. In its habits this fish resembles the *gadus callarias*, but it keeps nearer the bottom, and the male and female are said to consort with each other under the same stone.

FINS.—*Br.* 7; *D.* 15—19—16; *P.* 18; *V.* 6; *A.* 22—17; *C.* 32\*. *Faun. Gr.*, p. 147.

\* The following rays are attributed to the *gadus barbatus* by Artedi. FINS.—*Br.* 7 or 8; *D.* 13—24—20 or 21; *P.* 19; *V.* 6; *A.* 31—21.

[97.] 1. GADUS (MERLANGUS) CARBONARIUS. *Coal-fish.*

FAMILY, Gadoideæ. CUV. GENUS, Gadus. LINN. *Sub-genus*, Merlangus. CUV.  
*Merlangus carbonarius (Coal-fish).* SABINE, *App. Parry's First Voy.*, p. cccxi.

The *merlangi*, or coal-fish, differ from the true cod in having no barbels; they derive their English name from the dusky pigment which tinges their skin, and which, when they are handled, soils the fingers like moist coal. Specimens of the *Common coal-fish*, from four to five inches long, were taken in a trawl-net on the west coast of Davis' Strait, on Sir Edward Parry's first voyage. This fish, when full grown, bears a considerable resemblance to the salmon in the size of its scales and elegant form, notwithstanding its dark hue. It swims near the surface, and occasionally takes a mackerel-hook towed along in a smart breeze. The young resort to the rocky bays of the Orkneys and Hebrides in immense numbers, where, according to the period of their growth, they are known by the names of *cuddy*, *sithe*, *seth*, and *sillock*. They rise eagerly at an artificial fly of the rudest construction, and are secured with so much facility, and in such numbers, that an amateur angler would think lightly of the sport, even were he to overcome his disgust at the dirty colour and disagreeable smell his hands acquire in taking the fish from the hook. They yield, however, a plentiful harvest to the northern fisherman, who thus obtains both food, and oil for his lamp, with little exertion. On the Yorkshire coast the young are called *parrs*, and when a year old *billets*. They are said not to attain their full size until they are four years of age. The species is reported to exist sparingly in the Mediterranean.

The *merlangus vulgaris*, or Whiting, is enumerated in the list of the Massachusetts fish by Dr. J. V. C. Smith, and the same, or a very similar one, of the New York seas, is named *gadus albidus*, by Dr. Mitchill. La Hontan also says that whiting, like those of Europe, exist in the estuary of the St. Lawrence.

[98.] 2. GADUS (MERLANGUS) POLARIS. (Sabine.) *Polar Coal-fish.*

*Merlangus polaris.* SABINE, *Parry's First Voy.*; ROSS, *App. Parry's Third Voy.*, p. 110.  
 IDEM, *Parry's Polar Voy.*, p. 199. IDEM, *Sir John Ross's Second Voy.*, *App.* p. li.

This small species was taken on Sir Edward Parry's first voyage of discovery whilst swimming among the surface ice of Baffin's Bay; multitudes were gathered

on his second voyage, from the rocky pools of the Duke of York's Bay, in Southampton Island, where they had been left by the falling tide; it was again found equally plentiful, on his third expedition, in Prince Regent's Inlet; and on Sir John Ross's recent voyage great numbers were collected from crevices in the ice that covered Batty Bay, in July, 1833, and several were obtained, even in the winter time, in Felix Harbour. The *merlangus polaris* is also an inhabitant of the Spitzbergen Sea, having been found on Sir Edward Parry's polar voyage, as far north as latitude  $82\frac{3}{4}^{\circ}$  N., in plenty, in small bays where streams of fresh water run into the sea. It is highly probable that this is the same fish with the *gadus virens* of Fabricius, or the *ordleet*, as he supposes, of the Greenlanders, which is said to swim near the surface, and to be an agreeable article of food. The Polar coal-fish forms the principal nourishment of the numerous sea-fowl which migrate to the Arctic regions in summer, its habit of frequenting the top of the water rendering it an easy prey. The *beluga* drives it upon the ice in shoals. In the summer it is much infested by a *lernæa*, which attaches itself to the gills.

Captain Sabine describes it as being between five and six inches in length, and as being very nearly allied to the *gadus virens*, from which it may be distinguished by the third dorsal being larger than the two anterior ones, whereas, in *virens*, the middle one is the largest: the lower jaw rather exceeds the upper one; the tail is slightly forked. Captain James Ross says that there is a considerable variation in the number of rays in the fins, the average of a great many differing slightly from Captain Sabine's enumeration. Its length, he says, seldom exceeds ten inches.

FINS.—P. 18; V. 6; D. 14—16—19; A. 17—22; C. 42. SABINE.  
18; 6; 13—15—20; 17—21; 42 to 48. ROSS.

[99.] 1. GADUS (LOTA) MACULOSUS. (Cuvier.) *The Methy.*

FAMILY, Gadoideæ. CUV. GENUS, Gadus. LINN. Sub-genus, Lota. CUV.  
Gadus lota. PENN., *Arct. Zool., Intr.*, p. cxci. RICH., *Fr. Journ.*, p. 724.  
Gadus maculosus. LE SUEUR, *Journ. Ac. Sc. Phil.*, i., p. 83. An. 1817.  
Lota maculosa. CUV., *Rég. An.*, ii., p. 334. 1829.  
Molva maculosa. CUV., *in hl.* An. 1828.  
Methy. CREES. La loche. VOYAGEURS. Dog-fish. Eel-pout. UNITED STATES.

The *lotæ*, or *lings*, have two dorsals, one anal, and more or less numerous barbels. Some species are inhabitants of fresh water. The Common ling, or *gadus molva* of Linnæus, is supposed by Fabricius to be a Greenland fish, named by the natives *eevirksoak*, but he had not an opportunity of examining a specimen. The

Methy exists in every river and lake from Canada to the northern extremity of the continent. It is extremely voracious, and preys on all kinds of fish, which it takes chiefly or solely in the night. I opened several taken in Pine Island Lake, in the month of March, which were filled with cray-fish to such a degree, that the form of their bodies was quite distorted, the soft integuments of their bellies admitting of great dilatation. It spawns in February, and, consequently, at a period when the water is thickly covered with ice everywhere north of the great lakes of the St. Lawrence. Its roe consists of very small eggs, which are so numerous that Mr. Hutchins is reported, by Pennant, to have counted 671,248 in a single fish. When well bruised and mixed with a little flour, the roe can be baked into very good biscuits, which are used in the fur countries as tea-bread. The liver is also considered to be a delicacy, but the flesh is eaten only in times of great scarcity, being watery and tasteless, though in the few trials we were obliged to make of its qualities, it did not appear to be unwholesome. Dogs, accustomed to feed on the offal of every other kind of fish which exists in those countries, will not eat any part of this, even when pressed by hunger. Its European representative, on the contrary, the Burbot, is considered to be a delicate-flavoured fish.

At Fort Good Hope, on the lower part of the Mackenzie, I observed a fish of this genus, which differed from the ordinary state of the Methy in having much brighter and more varied colours, forming reticulations; but we were on the eve of embarkation, the pressure of other avocations prevented me from recording its characters, or even preparing a specimen,—and, returning by another route, I had no opportunity of seeing it again.

## DESCRIPTION

Of a recent specimen killed in Pine Island Lake, March 31, 1820.

FORM.—*Profile* oblong, tapering gradually into the lanceolate, acute extremity of the tail, which reaches nearly to the centre of the obovate caudal fin. The *body*, unless when distended with roe, or with its prey, is compressed, its greatest circumference being just behind the pectorals, and nearly equalling one-half its length: the depth of the body there is about one-sixth of the length. **HEAD** broad, depressed, the jaws of equal length and very obtuse: its length is contained rather less than six times in the total length, or rather more than five times when the caudal fin is excluded. *Eyes* small, with a lateral aspect, but from the flatness of the forehead appearing partly on the upper surface. The centre of the oval orbit is two lengths of its axis from the tip of the snout, and somewhat short of four lengths from the posterior edge of the gill-cover—there being five lengths and a half in the total length of the head. *Nostrils* anterior to the orbit, the apertures small, and the foremost furnished with a long, loose, skinny lid. The upper lip, attached to the intermaxillaries, fits into a fold of the integuments of the snout. The *intermaxillaries* are attached to the snout by cartilages which admit of a

rotatory motion but no protrusion: their lower ends are with the labials which lie in the angle of the mouth, thrust out a little by the extension of the jaws. The *labials* are about half as long as the intermaxillaries, their posterior extremities pass a little beyond the centre of the orbit. The *lower jaw* is strong, and there is a small cirrus attached to the tip of the chin. **TEETH.**—The intermaxillaries and lower jaw are armed with slender, hooked teeth, in even, card-like, rather broad belts. A still broader belt covers the knob of the vomer and anterior ends of the palate-bones. There are teeth of the same kind on the pharyngeal bones, and on a double row of tuberculous rakers on each branchial arch. The *tongue* is obtuse, fleshy, and smooth. **GILL-COVERS** rounded and edged with soft membrane; the branchial aperture is large, and its membrane, containing seven curved rays, is continuous with its fellow, forming a flap which is loose behind: the rays are semi-cylindrical, being flat exteriorly.

**SCALES** small, roundish, and so deeply imbedded in a gelatinous epidermis as to be scarcely perceptible in the recent fish. When examined with a lens, the concentric circles indicating their growth are perceived to be very regular, but no radiating furrows can be seen. The epidermis is covered with minute dark specks, most conspicuous though less crowded on the lighter-coloured sides and belly. In the dried specimen scales are perceptible, either scattered or crowded, on every part of the head, body, and fins, except the muzzle, lips, edges of the orbits, and labials: on the forepart of the body the scales are nearly their own breadth apart, but posteriorly they are more close, and on the tail they are in contact or even tiled: they are also crowded on the cheeks, gill-covers, and caudal fin; but very small and widely scattered on the dorsal and anal fins, and scarcely perceptible on the gill-membrane. As the scales dry they become depressed in the centre, or saucer-shaped. *Lateral line* marked by a continuous, slender furrow, lined or bordered with minute scales: it is nearer to the back than to the belly, and is slightly arched till it passes the first third of the anal fin, after which it takes a straight course and is no longer discernible, when it comes within three inches of the extremity of the tail. The anus is exactly midway between the snout and tip of the tail (excluding the fin).

**FINS.**—*Br.* 7\*; *P.* 16; *V.* 6; *D.* 12—74; *A.* 71; *C.* 50.

The *pectorals* are unequally obovate and contain sixteen rays. The *ventrals* or *jugulars*, situated anteriorly to the pectorals, are soft, slender, and tapering to a point: the first of their six rays is the strongest. The *first dorsal* contains six rays, the first of which is short, and the last one very slender. The distance from the snout to the anus being divided into four parts, the first dorsal occupies rather more than the anterior half of the fourth part. The *second dorsal*, commencing about a quarter of an inch from the first, contains seventy-four rays, the three or four first ones gradually increase in length, the margin of the rest of the fin is even, and it is rounded off at its termination. The fin in general is nearly half an inch lower than the first dorsal. The *anal* fin, commencing opposite to the ninth ray of the second dorsal, and close to the anus, is of equal height throughout, except the two or three first rays, which are short: it is rounded off at its termination like the second dorsal. The rays of the

\* Foster could find only six gill-rays in his specimen from Hudson's Bay.

dorsals and anal are, as in all fish, double, but they are most visibly so at their bases, their summits spreading very slightly. The *caudal* fin is obovate, its extremity being nearly semi-circular. It takes its origin in contact with the second dorsal and anal, but its form renders it sufficiently distinct: it contains fifty rays, the four central ones attached to the end of the vertebral column, the others to slender distinct interspinous bones, nine of the rays of the base above and below gradually increase in length, the other thirty-two are nearly equal to each other, but originating on the lanceolate tail give the peculiar form to the fin.

**COLOUR.**—*Head* and *back* dull chestnut brown tending to yellowish-brown, the back marbled with lighter spots: *belly* orange-white, becoming grey towards the sides by the aspersions of dark brown specks. *Ventrals* white.

#### INTESTINES.

The wide *œsophagus* is lined by a white membrane having longitudinal folds: the *stomach* is distinguished from it by still greater width, a stronger muscular coat, and by the reddish colour of its lining, which also presents more numerous and somewhat convoluted folds. The very small *pylorus* is so situated as to leave one half of the stomach in form of a *cul de sac*. An inch from the stomach the *cæca*, about sixty in number, encircle the intestine, uniting into ten large trunks whose orifices are close to each other: they are filled with thin feculent matter. The intestine gradually diminishes in calibre, and its coats become weaker towards the anus; next which, however, there is a more muscular portion with an approach to a valvular apparatus at its origin, formed by a contraction of the muscular coat, and a corresponding projection of the lining of the canal. The whole alimentary canal makes two convolutions, and its length to that of the fish, excluding the caudal fin, is as thirty-eight to twenty-two. The *liver* has a cream-yellow colour tinged with flesh-red: its transverse diameter is the greatest, and it has a small central triangular flap or lobe; it was observed, however, that the size and form of the liver varied considerably in different individuals. The gall-duct terminates in the intestine below the openings of the *cæca*; there is a dilatation in it equal in size to the gall-bladder itself. The *spleen* is situated near the rectum. The *air-bladder* has two short horns at its upper end, and its lining is encrusted by a number of stelliform fatty substances. The firm cordiform *kidneys* are lodged in a sac between the spine and lower end of the air-bladder. The *urinary bladder* is strong and muscular.

#### DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from end of snout to end of caudal fin	21	9	Length of attachment of 1st dorsal . . .	1	5
„ „ tip of tail . . . . .	20	4	„ „ 2nd ditto . . . . .	9	6
„ „ end of dorsal and anal fins	18	10	„ „ anal . . . . .	8	6
„ „ anus . . . . .	10	3	„ rays of 2nd dorsal, about . . . . .	1	1
„ „ commencement of 1st dorsal	7	10	„ „ anal . . . . .	0	11
„ „ edge of gill-cover . . . . .	3	10	„ central rays of caudal . . . . .	1	7
„ „ nape . . . . .	2	5½	„ from bases of caudal to its end . . . . .	3	2
„ of intermaxillaries . . . . .	1	2½	Greatest girth of body . . . . .	10	4
„ labials . . . . .	0	8	Length of aliment. canal from gullet to anus	35	1
„ lower jaw . . . . .	2	0	„ from gullet to pylorus . . . . .	4	0
„ pectoral fin . . . . .	2	3	„ pylorus to rectum . . . . .	29	1
„ ventrals . . . . .	1	4	„ of rectum . . . . .	2	0

[100.] 1. GADUS (BROSMIUS) FLAVESCENS. (Le Sueur.) *Yellow tusk*.

FAMILY, Gadoideæ. CUV. GENUS, Gadus. LINN. Sub-genus, Brosmius. CUV.  
 Le Brosme jaune (*Brosmerus flavescens*). LE SUEUR, *Mém. du Mus.*, v. p. 158.  
 An. 1817. Pl. 16, f. 2.  
 Tusk, or Cusk. NEWFOUNDLAND FISHERMEN.

The *brosmii*, or *tusks*, have only a single long dorsal.—Fabricius refers the *neyorpalloogak* of the Greenlanders to this sub-genus, but as he did not see the fish himself, and gives no description of it, we have no means of judging how far it agrees with the *Yellow tusk*, which inhabits the banks of Newfoundland sparingly. M. Le Sueur, who is our sole authority for the latter as a distinct species, does not say whether or not it is the same with the *cusk* of the Massachusetts coast, which Dr. J. V. C. Smith refers to the *brosmius vulgaris*. In the *Yellow tusk* the lower jaw is longer than the upper one, but in the *Common tusk* the upper jaw is the longest. The following is M. Le Sueur's description of the Newfoundland species.

COLOUR, generally, an agreeable yellow, the dorsal, pectoral, and anal, edged with black and white. The very thick skin is furnished with small, round, crowded *scales*, very irregularly placed. The *lateral line* is arched above the pectorals. FORM.—The *body* is long, broadest next the head, and compressed towards the tail. The *head* broad and flat, the snout obtuse and rounded. The *eye* large and oblique, the lower jaw has two *barbels*. The orifice of the mouth is wide. The teeth on the jaws and palate are sharp, with the points turned backwards, and are crowded into many rows. The pharyngeal bones, above and below, are toothed, and the branchial arches are armed on the sides with little tubercles studded with strong conical curved teeth. FINS.—*Br.* 7; *P.* 25; *V.* 6. The *dorsal* and *anal* are very long, and their rays consequently numerous, as is the case also with the *caudal*, which is of a large size. The *length* of the specimen was two feet. LE SUEUR, *l. c.*

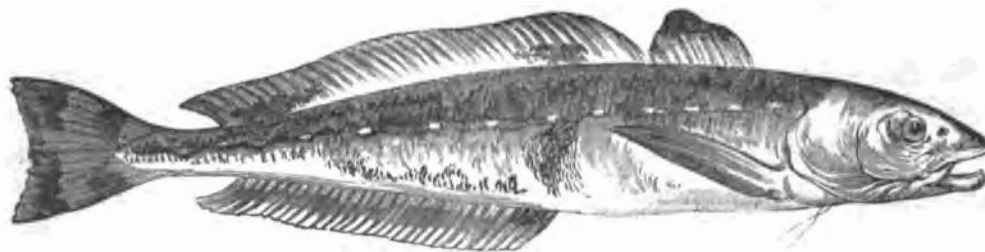
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Fabricius mentions one other species of *gadus* as an inhabitant of the Greenland seas, the *akooleäkeetsok*, which he supposes to be the *merluccius*, or hake, but this reference must be very uncertain, as his knowledge of the fish was derived solely from the reports of the natives.

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[101.] 1. GADUS (PHYCIS) PUNCTATUS (Mitch.) *Spotted Phycis*.

FAMILY, Gadoideæ. CUV. GENUS, Gadus. LINN. Sub-genus, Phycis. ARTEDI.  
Spotted cod (*Gadus punctatus*). MITCHILL, i, p. 372.



The sub-genus *phycis* is characterised by the ventrals containing only a single ray, which is often forked. The head is large, there is a barbel attached to the chin, and there are two dorsals, the second of which is long. The Spotted phycis is figured and described by Dr. Mitchill as one of the New York fish, though he says it is the rarest of this family in that quarter. Our wood-cut is from a sketch made by Lieutenant-Colonel Hamilton Smith, of a specimen which was captured off Halifax, Nova Scotia.

“Length ten inches. Colour of the back and sides pale brown or whitish, with lines between the scales; of the neck and belly dull white with suffusions of cream colour. First dorsal marked above with a black spot surmounted by the white tips of the rays. Anal brownish edged with black. Lateral line distinct and peculiar, consisting of a narrow black mark, alternating at spaces of half an inch apart, with white dashes about one-eighth of an inch long. In some individuals there is an imperfect whitish straight fillet under the lateral line. The chin has one small *cirrus*. Ventrals two cleft, the second ray two inches long. RAYS.—P. 13; V. 1; D. 9—47; A. 47; C. 23.” MITCHILL, *l. c.*



[102.] 1. MACROURUS RUPESTRIS. (Bloch.) *Rock Grenadier.*

FAMILY, GADOIDEIS AFFINIS. CUV. GENUS, MACROURUS. BLOCH.  
 Coryphæna rupestris. FABRICIUS, *Fauna Grænl.*, p. 154. No. 111.  
 Macrourus rupestris. SCHN., *Bloch*, p. 103, t. 26.  
 "Lepidoleprus cælorhynchus. RISSO, pl. vii., f. 22."  
 Ingmingoak. GREENLANDERS.

This fish exists in the bays of south Greenland, the European Atlantic, and Mediterranean. It inhabits great depths of water, and is fished for with a long line. When drawn to the surface its body is distended with air, and it emits a grunting sound like the gurnard. Its flesh is prized by the Greenlanders.

## DESCRIPTION

Compiled from Fabricius, Schneider, and Cuvier.

FORM.—*Body* oblong, thick anteriorly, slender posteriorly. *Head* large, depressed with a flat immoveable snout, formed by the union of the sub-orbital and nasal bones, projecting over the mouth. *Eyes* large and prominent. *Gill-openings* wide. *Mouth* ample. *Jaws* moveable as usual, and armed with very fine short teeth in five rows. *Tongue* and *palate* smooth. *Scales* silvery, hard, and armed on the head and forepart of the body with several longitudinal serrated ridges, on the posterior parts with only one ridge: the gill-membranes and fins are alone free of scales. *Lateral line* straight and near the back. *Anus* in the anterior third part of the fish. *Fins* pointed. The *second dorsal* and *anal*, both very long, unite to form the acuminate *caudal*: *first dorsal* short and high. A difference in the number of the second dorsal and anal rays, as given by Fabricius and Schneider, has evidently originated in the latter enumerating among the rays of these two fins those of the caudal.

FINS.—*Br.* 6; *P* 18; *V.* 8; *D.* 11—112; *A.* 112; *C.* —. FABRICIUS.  
 7; 19; 7; 1/11—124; 148; 272. SCHNEIDER.

PLATESSOIDEÆ.—*FLAT FISH.*

THE fish of this family were included by Linnæus in a single large genus, which was named *pleuronectes* by Artedi, to denote their peculiar habit of swimming on one side. They have, in fact, a character of which there is no example in any other family of vertebrated animals, that of both eyes being on the same side of the head, which is the uppermost when the fish swims, and is more or less deeply coloured, while the other side is always whitish. The orifice of the mouth is oblique, with unequal sides, and the greatly compressed body partakes more or less of the want of symmetry observable in the head; the pectorals are seldom uniform, the dorsal occupies the whole length of the back, the anal fringes the under edge of the body, and the ventrals, which are often joined to one another, appear like an anterior continuation of it. There are six gill-rays. The abdominal cavity, which is small, is prolonged into the substance of the tail to give room for the lodgment of the viscera, the anus being far forward. The cranium is composed of the ordinary number of bones, though their forms are curious, owing to both the orbits being on one side. There is no air-bladder, and these fish seldom leave the bottom. The latter circumstance may account for the fish of this family being found in all climates, the temperature of the bottom of the ocean being comparatively equable. The Flat fish yield a wholesome and agreeable article of diet to the inhabitants of every coast. The following are reported to inhabit the seas of the United States; but as many of them have been very imperfectly described, it is not certain whether they are all proper species, or even rightly referred to the subgenera. PLATESSÆ.—*Pleuronectes dentatus*, Summer flounder, LINN., SCHOEPP, MITCHILL; *Pleur. Americanus*, SCHN. (Rhode Island flounder, SCHOEPP); *Pleur. melanogaster*, Black-bellied flounder, MITCHILL; *Pleur. oblongus*, Spotted flounder, MITCHILL. HIPPOGLOSSI.—*Pleur. hippoglossus*, Halibut, SCHOEPP, PENN., MITCH., SMITH. RHOMBI.—*Pleur. argus vel lineatus*, BLOCH, CATESBY; *Rhombus maximus*, Turbot, SMITH. SOLEÆ.—Sole, *Pleur. solen*, PENN. (*Solea vulgaris*, SMITH). ACHIRI.—*Pleur. lineatus*, LINN. (*Pleur. mollis*, New York sole, MITCH.); *Pleur. plagiusa*, GARDEN, LINN.

It is highly probable that many of the above extend their range to the British American coasts. La Hontan mentions "*plies et turbots comme en Europe*," as frequenting the embouchure of the St. Lawrence, and Pennant enumerates the

Common flounder, halibut, plaice, and sole, as inhabitants of the American seas generally. The halibut and two others exist on the Greenland coast, and two species have been observed on the arctic coast of America. Four were noticed by Mr. Collie in the bay of Awatska, "one, allied to the *pleuronectes platessa* of Linnæus, having a spinous line extending from the posterior part of the eyes to the hinder and upper part of the operculum, the remainder of the head being smooth; another, noted as a variety of the last, but having the head covered with roughly projecting tubercles; the third, the *pleuronectes stellatus* of Pallas, and the fourth, supposed to be the *pleuronectes hippoglossus*. (?) Eschscholtz, speaking of the natural productions of Norfolk Sound, on the north-west coast of America, says that there is no great variety of fish, but the individuals are numerous. In his short list he includes a *pleuronectes* several feet long, probably the halibut, which is found abundantly in the same neighbourhood. "While we lay here," says the author of that voyage, "the natives supplied us very plentifully with halibut, which we bought of them for beads and small toys. The place where these halibut were caught is in the offing round the point of land. Our whale-boat was one day sent to this place with seven hands on a fishing party, but their success was greatly inferior to that of two Indians, who were fishing at the same time, which is rather extraordinary, if we consider the apparent inferiority of their tackle to ours. Their hook is a large simple piece of wood, the shank at least half an inch in diameter; that part which turns up, and which forms an acute angle, is considerably smaller, and brought gradually to a point: a flat piece of wood, about six inches long, and near two inches wide, is neatly lashed to the shank, on the back of which is rudely carved the representation of a human face. They bait their hook with a kind of fish called by the sailors squid (cuttle-fish), and having sunk it to the bottom, they fix a bladder to the end of the line as a buoy, and should that not watch sufficiently, they add another. Their lines are very strong, being made of the sinews or intestines of animals. One man is sufficient to look after five or six of these buoys; when he perceives a fish bite, he is in no great hurry to haul up his line, but gives him time to be well hooked; and when he has hauled the fish up to the surface of the water, he knocks him on the head with a short club, provided for the purpose, and afterwards stows away his prize at his leisure: this is done to prevent the halibut, which sometimes are very large, from damaging, or perhaps upsetting, his canoe in their dying struggles. Thus were we fairly beat at our own weapons; and the natives constantly bringing us plenty of fish, our boat was never sent on this business afterwards." Dixon also observed another flat-fish which is frequently mentioned in the account of the voyage under the name of

*sand-dab*. "Our hooks and lines were generally overboard, but the only kind of fish we caught was a sort greatly resembling a flounder, and called by the sailors sand-dabs." Lewis and Clark say that a flounder, the same with the Atlantic species, is well known at the mouth of the Columbia River, where it is often left on the beach by the recess of the tide. The Indians eat it and think it very fine. Mr. Collie saw a *rhombus* on the coast of California.

[103.] 1. PLEURONECTES (PLATESSA) STELLATUS. (Pallas.)  
*Stellated flounder.*

FAMILY, *Platessoides* (*Poissons plats*). CUV. GENUS, *Pleuronectes*. LINN. *Sub-genus*, *Platessa*. CUV.  
*Pleuronectes stellatus*. PALLAS, *Nov. Act. Petrop.*, i. p. 347. *An.* 1783. TILESIIUS, *ib. cit.*,  
i., t. ix., f. 1, p. 387. *An.* 1787.  
Cambala. RUSSIANS. Tanticu. KURILIANS.

In the sub-genus *platessa*, or the flounders, there is a row of obtuse cutting teeth on each jaw, and most frequently some teeth *en pavés* on the pharyngeal bones; the dorsal does not extend farther forward than the upper eye, and, like the anal, it leaves a naked space between its termination and the caudal. The flounders have a rhomboidal form, and in most the eyes are on the right side. They have two or three small cæca. On Sir John Franklin's first expedition we caught a flounder at the mouth of the Coppermine, and of several other rivers that fall into the Arctic Sea. As the subjoined brief description, which was the only memorial I could preserve of it, agrees pretty well with the published accounts and figures of the *pleuronectes stellatus* of Pallas, I have considered it to be that species. If this opinion be correct, the stellated flounder is most probably an inhabitant of the Kamtschatdale seas, and of the whole north coast of America. It is plentiful on the Kamtschatdale coast, near the mouths of rivers, and in sheltered bays, where it is most readily taken in May and June. In winter it is said to bury itself in the sand. It varies in size from ten to fourteen inches. Tilesius says that it is distinguished from all other species by the black stripes on the fins, and the forms of its tubercles or scales.

DESCRIPTION

Of a recent specimen, taken July 16, 1821, off the Coppermine River, lat. 67½° N.

FORM.—*Profile* of the body broadly elliptical, terminated by a strap-shaped tail and a caudal fin scolloped between the rays. *Eyes* on the left side, moderately large. *Nostrils*

close to the upper lip, so as to be closed by the retraction of the jaws. The upper margin of the *mouth* is formed entirely by the intermaxillaries, the labials lying in a membrane behind them, and acting as a lever in aid of their protrusion. Under jaw longer than the upper one. *Teeth* small, chisel-shaped, forming an even row on the intermaxillaries and lower jaw. Tongue conical, blunt, and smooth. *Palate* also smooth. Five *gill-rays*, the interior one, which is the smallest, being united to its fellow in the opposite membrane. The *dorsal* commences above the centre of the orbit, and ends at the strap-shaped tail: it is highest in the middle, thus having the form of an obtuse-angled triangle. The *anal* begins half an inch behind the anus, and is similar in shape to the dorsal, with which its termination corresponds: the two fins conjointly give a rhomboidal outline to the fish: their rays are simple but articulated, and the membrane is scolloped between them: the central rays of both fins are two inches long. There is a small *spine* at the beginning of the anal pointing forwards. The *ventrals*, situated under the pectorals, contain six rays. *Scales*.—Skin of both sides of the body studded with stellated, bony tubercles\*. *COLOUR* of the upper side liver-brown without spots, of the under surface white tinged with red towards the tail: the fins are reddish with broad vertical black stripes. *LENGTH* one foot.

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[104.] 2. PLEURONECTES (RHOMBUS) GLACIALIS. (Pallas?) *Arctic*  
*Turbot.*

GENUS, Pleuronectes. LINN. *Sub-genus*, Rhombus. CUV.

Pleuronectes glacialis. PALLAS, *Reise durch versch. Prov. des Rusch*, 1772-73, p. 706 † ?

This fish was taken in Bathurst's Inlet, under similar circumstances with the preceding. No specimens were brought home, and the description is too brief and general to serve to identify the species completely. Unless Pallas has overlooked the nearly hidden anal spine, ours is a different species from his.

\* Pallas describes these tubercles as follows:—"Tubercula omnia centro glabrata, hinc radiatim muricata, extimo spinulis longioribus subradiantia." Tilesius calls them "*tubercula stellata*," "*aculeato-stellata*," or "*stellula aculeata*;" and Mr. Collie, who observed the species in Awatska Bay, says that they are subpentagonal, set round with small blunt teeth. The stomachs of the individuals he opened contained small fishes. The rays of the fins are counted as follows by the two former authors.

RAYS.—*Br.* 3; *D.* 56; *A.* 37; *P.* 12; *V.* 6; *C.* 18. Pallas.  
6; 52; 40; 8; 6; 16. Tilesius.

† Pallas's short description of his *P. glacialis* is as follows:—"Dodrantalis, facie Flesi. Oculi a latere dextro fusco, subaspero; Latus album læve. Spinæ nullæ, nec ad pinnas, neque in lineâ laterali. Tractus capitis, pone oculos prominulus, scaber, sed non in tubercula divisus. Radii medii pinnae dorsi anique a latere fusco quasi spinulis minutissimis hispidati. Radii p. dorsi 56, ani 39. Frequens in oris arenosis Oceani glacialis."

## DESCRIPTION

Of a recent specimen, taken in Bathurst Inlet, lat. 67° 40' N., 5th August, 1821.

FORM.—*Profile* somewhat ovate, the snout rather acute, and the tail linear or strap-shaped for half an inch. HEAD.—*Eyes* moderately large, on the right side, near the snout. *Nostrils* between the eyes. *Mouth* small, its margin formed by obtuse lips; when closed the small, callous, obtuse tip of the lower jaw projects upwards. *Teeth* fine, brush-like, in an even band on both mandibles. FINS.—*Dorsal* and *anal* bordering the body to the height or depth of an inch, becoming narrower before and behind. There is a *spine* almost concealed by the skin at the commencement of the *anal*. The *ventrals* are under the *pectorals*; both are small. *Caudal* cuneiform, entire. SCALES small, those on the back rough-edged, those on the white sides smooth. *Lateral line* straight. COLOUR.—A mixture of yellowish-grey and dull, greenish-grey, somewhat clouded but without defined spots. *Belly* bluish-white. *Caudal* fin irregularly spotted with red. *Irides* wood-brown.

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## DISCOBOLI.

THE union of the ventrals into a disk with which the fish can adhere, as by a sucker, to stones and other substances, is a distinguishing character of this family. The species, few in number, are arranged in two genera—*Lepadogaster*, mostly European, and not hitherto detected in America; and *Cyclopterus*, distributed throughout the northern parts of the Atlantic and Pacific. The following have been enumerated among the fish of the United States. *Cyclopterus lumpus*, PENN., SMITH (*C. cæruleus*, MITCHILL); *C. minutus*, SMITH.—*C. ventricosus*, PALL., and *C. gelatinosus*, IDEM, inhabit the sea between Kamtschatka and America.

[105.] 1. CYCLOPTERUS LUMPUS. (Linn.) *The Lump.*

FAMILY, Discoboli. CUV. GENUS, Cyclopterus. LINN. Sub-genus, Lumpus. CUV.  
*Cyclopterus lumpus*. FABR., *Fam. Grænl.*, p. 131.  
 Common lump. PENN., *Arct. Zool., Suppl.*, p. 110. No. 13.  
 Blue lump fish (*Cyclopterus cæruleus*). MITCHILL, i., p. 480, pl. II., f. 7.  
*Nepeesa*, Angusedlok, male, Arnardlok, female, GREENLANDERS.

The genus *Cyclopterus* possesses a well-marked character in the form of the ventrals, whose rays surround the pelvis, and are united by a membrane into a single concave oval disk, or sucker. The mouth is wide, and the jaws and pharyngeals are armed with bands of small pointed teeth; the gill-covers are small, and the gill-openings are closed below by their membrane, in which there are six rays. The very large pectorals unite with each other almost under the throat so as to embrace the disk of the ventrals. The skeleton acquires little bony hardness, but the viscous skin, destitute of scales, is sprinkled with small hard tubercles. The stomach is pretty large, the cæca numerous, the intestine long, and the air-bladder of a moderate size. There are two sub-genera, *Lumpus* and *Liparis*, which are distinguished from each other by the form of the body and the presence of one or two dorsals. In the *lumps* there is a very low first dorsal supported by simple rays, and a second one with branched rays opposed to the anal; the body is thick. The *Common lump* appears to be an inhabitant of both sides of the North Atlantic, in all the temperate latitudes, and up to the Arctic circle; but it seems to be most

abundant about the 60th parallel, being very plentiful among the Orkney islands, and on the Greenland coast. Dr. Mitchill describes the lump of the New York coast as a distinct species, under the name of *Cyclopterus cæruleus*, but his figure is a tolerable representation of the Common lump, and no part of his description disagrees with this species,—the colours of his specimen being very similar to those of the “ pavonian sucker ” of Beaumaris Bay, described by the Reverend Hugh Davies, which differs from the common state of the lump merely in the brilliancy of its tints. Indeed this fish varies greatly in hue according to its age and sex, the male being generally more coloured. Lieutenant-Colonel Hamilton Smith obtained a lump resembling Mitchill’s, in the *Baie des Chaleurs* of the Gulf of St. Lawrence. Fabricius describes the lump as approaching the rocky bays on the Greenland coast, in the months of April and May, for the purpose of spawning. The female precedes and deposits her roe among the larger algæ, and in fissures of the rocks; the male shortly follows and fructifies the eggs, adhering so closely to the mass of roe, that the impression is left upon the hollow surface of the shield formed by the ventrals; after which he keeps watch over the sacred deposit, and guards it from every foe with the utmost courage. If driven from the spot by man, he does not go far, but is continually looking back, and in a short time returns. Even the well-armed wolf-fish hazards his life if he approaches the lump’s nest; for this creature, notwithstanding the smallness of its teeth, is (as we have already mentioned, p. 95, on the authority of Fabricius) capable of attaching itself to its adversary’s neck, and inflicting thereon a mortal wound. Lacépède denies the truth of the whole of this story, attributing its origin to the vivid imagination of some one who having occasionally seen two of these fish sticking to the same stone in the vicinity of a deposit of spawn, inferred that the cold and sluggish lump is animated by ardent feelings of constant love, conjugal tenderness and fidelity, and a devoted attachment to its offspring. But, notwithstanding the eloquence which this writer has employed to discredit the vulgar opinion of the lump’s care for its progeny, it is not perhaps altogether devoid of truth, and it can be supported, if not by direct testimony, at least by analogous facts. The gouramy (*osphromenus ofax*), one of the *anabasideæ*, which attains the size of a turbot, is said to dig a pit in the sand wherein it deposits its roe: we have quoted, in page 96, Olivi’s account of the male Venetian goby building a nuptial chamber for the reception of the spawn which he impregnates, as it is deposited there by various females that come in succession into his harem: the hassars of Essequibo, belonging to the genera *Doras* and *Callichthys* of the siluroid family, not only construct a nest of leaves or grass to contain their roe, but the male and female (for they pair) watch and de-



send it till the young come forth \* : the protection which some of the cartilaginous fishes are reported to afford to their young, by receiving them into their mouths, is not less remarkable : in short, when we consider the instinct with which various reptiles and insects are endowed for the preservation of their eggs, there does not appear to be anything surprising in the fact, that some tribes of fish have been formed with similar desires and powers.

The food of the lump consists chiefly of soft *molluscæ*, particularly small *ptero-podes* and *acalephæ*, as *cïo*, *medusa*, and *berœe*, which abound in the northern seas. The Greenlanders eat its flesh, either cooked or dried, and its skin raw, throwing away only the tubercles, being in this respect less nice than the seals of the Pentland firth, which devour a great many lumps but reject the skins. If the authority of Sir Walter Scott is to pass current in gastronomy, the lump, or *cock-paidle* as it is named in Scotland, is a fish of good quality, for he makes Mr. Oldbuck give the same price for one that he does for the *bannock-fluke*, or turbot. The epithet of *cock-paidle* seems to have originated in the resemblance of the first dorsal, which is enveloped, like the rest of the fish, in a thick, tuberculated skin, to the comb of a domestic cock. Sibbald mentions another "*gibbosus piscis*," as known in Scotland by the name of "*hush-paidle*," or "*bagaty*." Not having access to an American specimen of the lump, I shall omit the description.

FINS.—*Br.* 4; *D.* 0—11; *P.* 20; *V.* 6; *A.* 11; *C.* 12. FABRICIUS, l. c.  
6; —11; 17; 6; 11; 9½. Scottish specimen.

[106.] 2. CYCLOPTERUS MINUTUS. (Pallas.) *Diminutive lump.*

Cyclopterus minutus. PALL., *Spic. Zool.*, vii., p. 14, pl. 3, figs. 7—9.  
FABR., *Favn Grœnl.*, p. 135. ROSS, *App.*, p. xlvi.  
Nepeesardloorksook. GREENLANDERS.

Captain J. C. Ross says "Pallas's description of this extraordinary and beautiful little fish is most perfect. It is found in many parts of the Atlantic Ocean; Fabricius observed it in the southern parts of Greenland, and great numbers were taken by us from among the extensive floating patches of sea-weed that are met with off that coast; but it has never been seen at any great distance to the north-

\* This is not the only analogy that these fishes present to the *anabasidæ*. Like the latter they travel over land in quest of water when the pools which they inhabit dry up, and, according to Indian information, they also possess the power of carrying an internal supply of water, but we are not informed whether the reservoir be situated over the gills, as in the *anabasidæ*, or elsewhere.

ward of the Arctic circle. It rarely much exceeds an inch in length, and is therefore not used by the natives of Greenland as food, but constitutes the chief means of subsistence to the several species of gulls which are seen hovering over those banks of sea-weed in astonishing numbers." Ross, *l. c.*

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[107.] 3. *CYCLOPTERUS SPINOSUS.* (Fabricius.) *Spiny lump.*

*Cyclopterus spinosus.* FABR., *Faun. Grænl.*, p. 134.  
*Nepeesardlook.* GREENLANDERS.

Fabricius saw but a single individual of this species, which he obtained in the southern part of Greenland. It is not eaten by the natives.

The tubercles of the skin are not ranged in rows as in the lump, their bases are rough, and they rise into a longish spine in the centre, the largest being upon the upper parts, while the belly is smooth. The first dorsal is not so high, nor so thick, as in the lump, and its edge is not armed with tubercles, but its soft rays are evident enough. The hue of the fish is blackish, the belly whitish, and the twelve first rays of the pectorals quite white. FINS.—*Br.* 6; *D.* 6—11; *P.* 23; *V.* 6; *A.* 10; *C.* 10.—*Fauna Grænl.*

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[108.] 4. *CYCLOPTERUS VENTRICOSUS.* (Pallas.) *Bellying lump.*

*Cyclopterus ventricosus.* PALL., *Spicileg.*, II., 1, 2, 3.  
*Lepadogaster ventricosus.* SCHNEID., *Bloch*, p. 3.

This species being an inhabitant of the straits which separate Kamtschatka from America, and therefore belonging equally to both continents, ought to be enumerated in a list of American fish.

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[109.] 1. *CYCLOPTERUS (LIPARIS) COMMUNIS.* (Artedi.) *Unctuous sucker.*

FAMILY, Discoboli. CUV. GENUS, *Cyclopterus*. LINN. *Sub-genus*, *LIPARIS*, ARTEDI.  
*Cyclopterus liparis.* FABR., *Faun. Grænl.*, p. 135. ROSS, *App. Parry's Polar Voyage*, p. 199.  
*Liparis communis.* SABINE, *App. Parry's First Voyage*, p. ccxii.; ROSS, *App.*, p. xlvii.  
*Abapokeestok.* GREENLANDERS. *Sea-mail.* YORKSHIRE FISHERMEN.

The *Unctuous sucker* is said to inhabit all the northern seas. It abounds on

the Greenland coast, and was taken on the west side of Davis' Strait, in the 70th parallel of latitude, on Sir Edward Parry's first expedition, and more recently near Felix Harbour, in Regent's Inlet, by Captain James C. Ross. The same officer observed it on the north side of Spitzbergen in  $80\frac{1}{2}^{\circ}$  of latitude. Fabricius says it feeds upon young fish, small crustaceæ, and marine confervæ. It is not eaten by the Greenlanders. The fish of this sub-genus have only one dorsal, which is, like the anal, pretty long: the body is smooth, elongated, and compressed towards the tail. I have had no opportunity of comparing American specimens of the unctuous sucker with the European fish, but Captain Sabine says that those taken in Davis' Strait differ in no respect from the unctuous suckers of the English coast. Captain James C. Ross states that the average length of those that came under his observation, in his various voyages, was about three inches.

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Fabricius notices a *liparis* of a larger size, which is known to the Greenlanders by the name of *amersulak*. Though this kind attains the length of a foot, and agrees, he informs us, in many particulars with the *cyclopterus gelatinosus* of Pallas, he does not think that it is a distinct species from the preceding one.

The following notice of a fish of this family, which inhabits Behring's Strait, is from the Appendix to Captain Beechey's Voyage. "Off St. Lawrence Island was caught in a dredge, a fish apparently allied to the genus *Liparis*. It had the ventral fins placed before the pectorals, but united and continuous with them; a flat, raised, and rough tubercle, of nearly the diameter of an English sixpence, was seated forwards between the pectorals, its anterior part reaching as far as the ventrals: its *cæca* were pretty numerous (COLLIE). The roughness of this tubercle renders it difficult to refer the fish to any known species, but it is probably nearly related to the *cyclopterus gelatinosus*, Pallas, a *liparis* which is known to inhabit the seas in which this was obtained. The existence of *cæca* removes it from *Lepadogaster* of Gouan." BENNETT, *App.*, p. 50.

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## ECHENEIDEÆ.

THE members of this family, which contains only one genus, may be at once recognised by a flat disk on the top of the head with which they attach themselves to sharks, ships' bottoms, &c. : it is composed of transverse moveable cartilaginous plates, toothed or spinous on their posterior edges, and divided into two series by a mesial longitudinal line. The *echeneideæ* have an elongated body clothed with small scales ; a single, soft dorsal opposite the anal ; the head altogether flat above ; the eyes lateral ; the mouth horizontal and rounded ; the lower jaw projecting beyond the upper one, and armed, like the intermaxillaries, with small teeth in card-like plates ; a very uniform row of slender teeth, resembling eye-lashes, on the edge of the labials, which form the border of the upper jaw ; the vomer furnished anteriorly with a cardiform stripe of teeth, and its whole dilated surface as well as the tongue rough. They have eight gill-rays, the stomach forms a wide, blind sac, the cæca are six or eight, the gut is wide and short, and they want the air-bladder. The *echeneideæ* are very disagreeable-looking fish, the flatness of the top of the head giving them the appearance of swimming belly upwards : they fasten themselves upon the shark apparently for the purpose of being conveyed at ease through the ocean, and of being ready to consume any small fragments that drop from the monster's jaws when he takes his prey. Great numbers attach themselves to ships' bottoms in the tropical seas, particularly on the coast of Africa, and when the cook throws the washings of his coppers overboard, they dart off to feed upon the grease and boiled pease with which the water is soiled, returning again in a short time to the ship, swimming with a wriggling motion like an eel, and with considerable velocity, so as to overtake with ease a vessel going before a brisk gale. They are wary in taking a bait, but may be occasionally allured by a pellet of fat, or a little piece of greasy dough, covering a very small hook. The *echeneideæ* inhabit both the Atlantic and Pacific, being numerous only within the tropics ; their northern limit, in the former sea, appears to be about the 48th parallel. A well-known Mediterranean species, which exists also in the ocean, was fabled by the ancients to possess the power of arresting a ship in its course, whence its name of *εχενίς*, and *echeneis* among the Greek and Roman authors, and of *remora* by more modern writers. The same species, and another of a larger size named *naucrates*, are included by Drs. Mitchill and Smith in their respective lists of the fish of New

York and Massachusetts, but their identity with those known to European naturalists by the same names is questionable. Dr. Mitchill enumerates twenty-four plates in the disk of his Big oceanic sucker (*echeneis naucrates*), while the *naucrates* of Cuvier has only twenty-two; and Dr. Smith's figure of the echeneis of Boston, which he refers to *remora*, represents a much more slender fish than the Mediterranean one of that name, the number of the plates of the disk being, however, eighteen in both. *Echeneis lineata* of Schneider has only ten plates in the disk, and *E. osteocheir* of Cuvier has the pectoral rays compressed, bony, and terminated by a slightly crenated little plate.

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[110.] 1. ECHENEIS NAUCRATES. (Auct.) *Ship-master echeneis*.

FAMILY, Echeneidae. GENUS, Echeneis. ARTEDI.

A specimen of an echeneis in the Zoological Museum, obtained by Mr. Audubon on the banks of Newfoundland, has twenty-two pairs of nearly transverse plates in its disk, agreeing in this and other respects with the accounts of the *echeneis naucrates*, to be found in ichthyological works, but I have had no opportunity of procuring an authenticated example of the latter wherewith to compare it. The *naucrates*, or ship-master, inhabits all the warmer districts of the Atlantic, and was taken by Mr. Collie among the South-Sea Islands.

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## MALACOPTERYGII APODES.

## ANGUILLIFORMES.

[111.] 1. ANGUILLA ROSTRATA. (Le Sueur.) *Beaked-eel*.

FAMILY, Anguilliformes. CUV. GENUS, Anguilla. THUNBERG. *Sub-genus*, MURÆNA. LACÉP.  
 MURÆNA rostrata. LE SUEUR, *Journ. Ac. Sc. Phil.*, i., p. 81. AN. 1817.

THIS order contains only one natural family of which the members have serpentine bodies, clothed with thick, soft skin in which the scales are scarcely perceptible, their ribs are few, and they have no cæca; almost all of them possess air-bladders, often of very curious shapes.—The EEL family may be recognised by their small opercula, surrounded concentrically by the gill-rays, and enveloped in the skin, so that the gill-opening is reduced to a small tube whose orifice is far back. Their bodies are long and slender, and their scales, embedded in a fat thick skin, become visible only when this dries up: they all want the ventral fins and pyloric cæca, and their anus is far back. All these fish were included by Linnæus in his great genus MURÆNA, which has been divided and subdivided by subsequent writers, who have introduced many new designations for their groups, and applied the generic name *muræna*, each after his own fancy, to divisions of very different extent and value.—The eels, *anguillæ* of Thunberg, or *murænæ* of Bloch, are known by the double character of the existence of pectoral fins and of the gill-openings being placed beneath them. Their stomach is a long blind sac, their gut almost straight, and their elongated air-bladder has a peculiar gland in its middle. The extent and form of the vertical fins serve to characterise the minor divisions of *anguilla*, such as the *true eels*, or *murænæ* of Lacépède, the *congers* or *congris* of Cuvier, and the *ophisuri* of Lacépède.—The murays, *murænæ* of Thunberg (*gymnothorax*, Bloch, *murænophis*, Lacépède), want the pectorals altogether, their gill-openings are merely a little hole on each side, and their gill-covers and their small feeble rays are so concealed by the skin, that their existence has been altogether denied by able naturalists: their stomach is a short bag, their air-bladder small, oval, and high up in the belly.

The *Common eel* of Europe belongs to the TRUE EELS, or that division of Thunberg's genus *anguilla*, in which the commencement of the dorsal is pretty far behind the pectorals, and to a minor group in which the upper jaw is shorter than the under one. The French fishermen recognise in the Common eel of ichthyological writers (*muræna anguilla*, Linn.) four different kinds or, as they say, species, viz., *l'anguille verniaux*, which is the most common; the *long-beaked eel*, which has a more compressed and pointed snout; the *flat-beaked eel*, or *grig* of the English, in which the snout is flatter and more obtuse and the eye smaller; and *l'anguille pimperneaux*, or *glut-eel*, which has a shorter snout and larger eyes than the others (*Règne Animal*).—The *Common eel* is mentioned by Pennant, Schoepf, Mitchill, Smith, and many other writers and travellers, as existing in America, and abounding especially in the St. Lawrence, but like many other North American fishes, supposed to be identical with the European ones of the same name, the species does not appear to have been determined by an actual comparison of specimens, nor have I discovered in the accounts of American fish, any notice of the four kinds or species we have just alluded to. M. Le Sueur describes five species which inhabit the waters of Massachusetts and New York, under the names of *muræna rostrata*, *Bostoniensis*, *serpentina*, *argentea*, and *macrocephala*, all of them, he believes, previously unknown to naturalists\*. His *muræna rostrata* was found in lakes Cayuga and Seneca, whose waters fall into the St. Lawrence; but whether it be the species which forms the object of the extensive eel-fisheries on this river, of which we shall shortly give an account, we have no means of determining. As he mentions that its eyes are large, it is not likely to be the long-beaked eel of the *Règne Animal*. De Witt Clinton states that the Common eel has often been observed endeavouring in vain to surmount the falls of Niagara, by winding its way upwards among the moist and slippery rocks, and that it is altogether unknown in the superior waters of the St. Lawrence †. Mr. Todd was, however, informed that an Indian speared an eel, three feet long and five or six inches in circumference, at the mouth of the Nattawasaga, which flows into Lake Huron. He had an opportunity, shortly after it was killed, of conversing with several Canadians who saw it, and who assured him that it was actually an eel. The lamprey being well known, both to the Indians and Canadians, could not have been mistaken by either of them for an eel. The surprise which the capture of

\* Dr. Mitchill mentions *anguilla vulgaris*, *conger* and *oceanica*, as New York fish, the latter being, he supposes, described only by himself.

† He also informs us that eels were unknown in the Passaic above the great falls until a canal was cut at Paterson, since which time they have become plentiful in the upper branches of that river. *Phil. Tr., New York*, i., p. 148.

this fish excited, proves that it is very rare in those parts. I never saw any kind of eel in the rivers of the Fur countries, nor heard of one existing there. Although the gill-nets used by the natives and fur traders in fishing have the meshes too large to retain an eel, that fish could scarcely have escaped their notice did it exist in any numbers in the northern waters. The non-existence of the eel in the waters of the Fur countries is the more remarkable from its being an inhabitant of the lakes and rivers of the southern part of Greenland, though in small numbers. Fabricius says it is called *neemereek* by the natives, and that the largest which he saw was thirty inches long and six in circumference. It is an object of abhorrence to the Greenlanders, who will not eat it. According to Vancouver, "a small sort of eel" of a yellowish-green colour and extremely good flavour, inhabits Port Discovery, in the straits of Juan da Fuca.

The following account of the mode of fishing for eels, which prevails above Quebec for fifteen leagues along the St. Lawrence, is from La Hontan. "At low water they stretch out hurdles to the lowest water-mark, and that space of ground being then dry by the retreat of the water, is covered over and shut up by hurdles. Between the hurdles they place, at certain distances, instruments called *ruches*, from the resemblance they bear to a bee-hive, besides baskets and little nets belayed to a pole, which they call *bouteux* and *bouts de quièvres*. Then they let all stand in this fashion for three months in the spring, and two in the autumn. Now as often as the tide comes in, the eels looking out for shallow places, and making towards the shore, crowd in among the hurdles, which hinder them afterwards to retire with the ebb water; upon that they are forced to bury themselves in the above-mentioned engines, which are sometimes so over crammed that they break. When it is low water, the inhabitants take out the eels, which are certainly the biggest and largest in the world. They salt them in barrels, where they will keep a whole year without spoiling, and indeed they give an admirable relish in all sauces, nay, there is nothing that the council of Quebec desires more than that this fishery should be plentiful in all years." (La Hontan, An. 1684. Pink. Coll.) Kalm, travelling through Canada nearly ninety years afterwards, drew up a description of the same fishery, which we shall also quote, as it differs from the preceding in the details, and gives us some further insight into the habits of the eel. "They place hedges along the shore made of twisted osiers, so close that no fish can get through them, and from one foot to a yard high, according to the different depth of the water. For this purpose they choose such places where the water runs off during the ebb, and leaves the hedges quite dry. Within this enclosure they place several weels, or fish traps, in form of cylinders, but broader below. They



are placed upright, and are about a yard high and two feet and a half wide: on one side, near the bottom, is an entrance for the fishes, made of twigs, and sometimes of yarn, made into a net. Opposite to this entrance, on the other side of the weel, looking towards the lower part of the river, is another entrance like the first, and leading to a box of boards about four feet long, two deep, and two broad. Near each of the weels is a hedge leading obliquely to the long hedge, and making an acute angle with it. This latter hedge is made in order to lead the fish into the trap, and it is placed on that end of the long hedge which looks towards the upper part of the river; now when the tide comes up the river, the fish, and chiefly the eels, go up with it along the river-side; when the water begins to ebb, the fish likewise go down the river, and meeting with the hedges they swim along them, till they come through the weels into the boxes of boards, at the top of which there is a hole with a cover, through which the fish can be taken out. This apparatus is made chiefly for the eels. In some places hereabouts they place nets instead of the hedges of twigs." The following passage occurs also in the same work. "They catch eels and porpesses at Quebec at the end of September and during the whole month of October. The eels come up the river at that time, and are followed by the porpesses which feed upon them." (Pink. Coll., xiii., pp. 632—672.)

As the Common eel thrives and multiplies in ponds from whence it cannot migrate to the sea, it becomes a matter of interest to ascertain whether there be any specific distinction between the resident and migratory kinds, and the fact that the eel exists in North America, in those parts only to which it has access from tidal waters, is important in such an inquiry.

#### DESCRIPTION

Of the *Beaked eel* of Lake Cayuga, quoted from M. Le Sueur.

"Snout elongated, pointed, and straight; eyes large and situated very near the angle of the mouth; body tumid in the centre, narrowed to a point at both extremities: upper parts varied with grey and olive, sometimes of a slate-blue: lower parts white: dorsal and anal fins reddish, which colour deepens as it approaches the tail; pectoral fins small, acute, and bluish. Length from eighteen to twenty-four inches."

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There is little doubt of the North American coasts being frequented by some of the numerous species of *muræna* (Thunb.). *Muræna moringa* of Cuvier is figured in Catesby, pl. 21, from a Bahama specimen, and Dr. Mitchill mentions *muræna meleagris* among the New York fish. The black and green muray of Catesby, pl. 20, is considered by Pennant to be the common *muræna helena* of Linnæus.

[112.] The *OPHIDIUM VIRIDE* of the *Fauna Grælandica* is unknown to Cuvier, though he believes it to be allied to the Eels. The species is said to attain the size of a cod, but the only specimen seen by Fabricius measured no more than two inches. It is taken with a hook and bait in deep water, on the southern coast of Greenland, and is eaten, when of sufficient size, by the natives, who call it *oonernak*.

It resembles a blenny in form, the head being broader than the body and grooved betwixt the eyes. The mouth is wide, beardless, and toothless; the gill-rays are seven in number, the membrane ventricose; there are eleven rays in the pectorals; the dorsal, beginning behind the head, is, together with the anal, united to the caudal, whose longer rays are produced to a point; there are no ventrals; the anus is situated nearer to the head than to the end of the tail. The whole fish has a green colour except the belly, before the anus, and the fins, which are white. *Fauna Grænl.*, p. 142.

A fish taken from the stomach of a kittiwake gull, in Prince Regent's Inlet, was considered by Captain James C. Ross, as identical with Fabricius's *ophidium viride*, from its accordance with the description of that author. *App. Parry's Third Voyage*, p. 110.

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[113.] 1. *SACCOPHARYNX AMPULLACEUS*. *The Bottle-fish*.

FAMILY, Anguilliformes. CUV. GENUS, Saccopharynx. MITCHILL.  
*Ophiognathus ampullaceus*. HARWOOD, *Ph. Tr., An.* 1827, p. 49, pl. 7.

In this singular genus the body, capable of being inflated like a sack or leathern bottle, is terminated by a very long and slender whip-like tail, edged above and below by the narrow dorsal and anal which unite at its tip. The mouth, armed with long sharp teeth, is cleft far past the eyes, which are close to the very short pointed snout. The gill-openings, having the form of irregular slits, and large enough to permit the three branchiæ to be seen, are under the very small pectorals. The skin is soft, slimy, loose, and slightly granular in appearance. The extensibility of the jaws and throat is extraordinary, being even greater than that exhibited by the serpent tribe. Only two examples of the genus are known to have been taken, and, with the exception of dimensions, they realise many of the popular accounts of the great American sea-serpent. They are voracious fish, with a capacious stomach and short straight gut. One of the specimens had recently before its capture swallowed a fish longer than its own body, and the

other had apparently exhausted itself in vain attempts to gorge a sea-perch thicker than itself. The individual described by Dr. Harwood, measuring four feet and a half in length, was captured in the entrance of Davis' Strait, by Captain Sawyer, of the ship *Harmony*, and the other was taken by Captain Hector Coffin, about midway between the Labrador coast and Ireland, in the 52nd parallel of latitude. A description of the latter, by Dr. Mitchill, is contained in the first volume of the *Annals of the Lyceum of New York*, but it is unaccompanied by a figure, and the details which are given do not clearly point out the differences between it and Dr. Harwood's *ampullaceus*. Dr. Mitchill, believing his fish to be the *stylephorus chordatus* of Shaw, appears to have intended to retain the specific appellation, and merely to change the generic name to *saccopharynx*, which having the priority of *ophiognathus* must be adopted.

In Dr. Harwood's fish the anal terminates insensibly fourteen inches, and the dorsal twenty and a half, short of the tip of the tail, and there are a few slender filaments springing from near the termination of the latter; but in the *saccopharynx chordatus* the dorsal and anal extend in form of fillets, or narrow ribands, quite to the tip of the tail, where they unite with a very indistinct caudal, of which Dr. Mitchill could perceive only a few hair-like rays. This author also mentions a whitish longitudinal stripe on each side of the dorsal fin, and another less evident and disappearing sooner, on each side of the anal. About fifty pairs of slender barbels or threads an inch long depended from the dorsal stripes, all the way from the head down the back, and along the tail. As soft barbels go to decay generally sooner than other parts of a fish, the specimen of *ampullaceus* may have been imperfect in these appendages, and also in the extent of the vertical fins. In *chordatus* the tail was sufficiently flexible to allow several knots to be tied on its tip as upon a piece of whip-cord. It had no teeth on the lower jaw, while *ampullaceus* had a single series of long teeth on the intermaxillaries and lower jaw. Dr. Mitchill's specimen was a female, with large ovaries full of eggs, but the sex of Dr. Harwood's is not mentioned.

	DIMENSIONS.	
	<i>S. ampull.</i>	<i>S. chordatus.</i>
	Inches.	Inches.
Total length . . . . .	54	72
Length from tip of snout to eyes . . . . .	0½	0½
"    "    angle of mouth . . . . .	2¼	3
"    "    gill-openings . . . . .	5¼	0
"    "    dorsal . . . . .	18	11
"    "    anus . . . . .	19	14
"    anus to tip of tail . . . . .	35	58
Circumference of inflated body . . . . .	9	0
Greatest diameter of ditto . . . . .	4	0

[114.] 1. OPHIDIUM STIGMA. (Bennett.) *Branded ophidium*.

FAMILY, Anguilliformes. CUV. GENUS, Ophidium. LINN.  
 Ophidium stigma. BENNETT, *App. Beechey's Voy.* ined.

The *ophidia* resemble the *anguillæ* in the backward position of the vent and the union of the dorsal and anal to the caudal, which forms a pointed extremity to the fish; the body is long and compressed like the blade of a sword, and covered, as in the eels, with small scales planted irregularly in the substance of the skin. These fish differ, however, from the eels in the wideness of their gill-openings, which are furnished with a conspicuous operculum, and a membrane supported by short rays: their dorsal rays are jointed but not branched.—The genus is subdivided in the *Règne Animal* into the *true ophidia*, which have two pairs of small barbels attached to the tip of the hyoid bone and depending from the throat; and the *fierrasfers*, which want these appendages, and have a dorsal so slender that it looks like a mere fold of the skin. The *Cirrhous ophidium* of Dr. Mitchill, which is an inhabitant of the New York seas, belongs to the first division; but the *Spinous ophidium* of the same author is evidently a *centronotus*, and of the same species, or at least very nearly allied to the Labrador fish which we have described at page 91.

The *Branded ophidium* of Mr. Bennett was discovered in Kotzebue Sound, on Captain Beechey's recent voyage to Behring's Strait, but the only specimen that was obtained was not preserved.

“The caudal, dorsal, and anal fins were united into a transparent ridge; the scales were very small, and the rays of the branchial covering distinct.”—Collie. “Its colour dilute-brown with void swathes or spots, and a purplish spot near the beginning of the dorsal fin. Its snout obtuse, chin with a large gibbosity, and teeth small. Its length five inches.”—Lay. Its peculiar characters, gathered from the notices preserved of it, are thus summed up by Mr. Bennett.—“*Ophidium (imberbe?) pallidè brunneum, fasciis maculisque plurimis; macula magna purpurea ad ortum pinnæ dorsalis.*”—BENNETT, l. c.

[115.] 2. OPHIDIUM PARRII. (ROSS.) *Parry's Ophidium.*

*Ophidium Parrii.* Ross (Captain J. C.), *App. Parry's Third Voy.*, p. 109, and *Polar Voy.*, p. 199. *IDEM*, *App. Ross's Second Voy.*, p. xlvii.

This species, discovered and described by Captain James C. Ross, has not come under the notice of any other naturalist. It was first seen on Sir Edward Parry's third voyage in Baffin's Bay and Prince Regent's Inlet, swimming among ice, in the cavities of which it finds refuge from the sea-fowl, who, from its keeping near the surface, would find it an easy prey if deprived of such retreats: a glaucous gull, shot near Felix Harbour, on Sir John Ross's recent voyage, ejected one, measuring four inches in length, from its stomach. Captain J. C. Ross informs us that this ophidium belongs to Cuvier's sub-genus *Fierasfers*, and in its general appearance approaches nearly to the *Ophidium viride* of Fabricius (p. 271), but has very much larger pectoral fins, the number of their rays being between three and four times greater than in Fabricius's fish. His description of it is as follows:—

“HEAD very obtuse, being of equal length, depth, and transverse diameter, broader than the body, flattened and grooved between the eyes, which are lateral and rather large; irides pearl-white. Mouth rather large, placed at the extremity of the head, and armed with numerous minute teeth on the palate and either jaw: lower jaw rather longer and without cirrhi. BODY three times the length of the head, ensiform, much compressed, and gradually tapering towards the tail, which is pointed. Neck much arched, giving a greater depth to the body than to any other part. Back of a dark greenish-brown colour, which is lighter on the sides; belly before the vent white; vent nearer the head; fins partake of the colour of that part of the body on which they are inserted. FINS.—The dorsal, which rises just behind the head, and anal, which commences close to the vent, unite with the caudal, and together consist of ninety-five rays, of which there are fifty in the dorsal and superior half of the caudal, and forty-five in the inferior half of this fin and the anal. The pectoral fins, which are very large, contain thirty-seven rays, and when stretched backwards along the body, extend rather beyond the vent, completely covering the whole of the belly and throat. The individuals varied from four to eight inches in length. The following measurements are of an ordinary-sized fish:—

	Inches.	Lines.		Inches.	Lines.
“ Length to the caudal fin . . . . .	4	6	Length to the vent . . . . .	1	8½
“ of the caudal . . . . .	0	8½	Height of dorsal or anal . . . . .	0	9½
“ head . . . . .	1	2½	Total length of fish . . . . .	5	6
“ body . . . . .	3	7	Greatest depth of body . . . . .	1	5”

Ross, *l. c.*

On Sir Edward Parry's Polar expedition a putrid ophidium was found among

some sea-weed on Walden Island, to the north of Spitzbergen, which was considered to belong to this species, but the pectoral fin, though of large size, contained only twenty-eight rays.—Ross, *Parry's Polar Voy.*, p. 199.

[116.] I. AMMODYTES LANCEA. (Cuv.?) *Sand lancee.*

FAMILY, Anguilliformes. CUV. GENUS, Ammodytes. LINN.  
 Ammodytes tobianus. FABRICIUS, *Fauna Grœnl.*, p. 140.  
 Lance (*Ammodytes tobianus*). PENN., *Arct. Zool.*, ii, *Suppl.*, p. 113.

The *lancees* have, as their name imports, an elongated body like the preceding genera, a dorsal fin supported by unbranched jointed rays occupying a great part of the back, an anal of a similar appearance, and a forked caudal separated from the other two by small spaces. The snout is pointed, the upper jaw extensile, but shorter when the mouth is shut than the lower one. The stomach is fleshy and pointed, and they have neither air-bladder nor pyloric cæca. They feed on worms, and bury themselves in the sand, from whence the fishermen dig them when the tide retires. Pennant states the *Ammodytes tobianus* of Linnæus to be plentiful at Newfoundland, and Dr. Mitchill enumerates it among his New York fish; but as naturalists have until lately confounded two species under the Linnæan name, and the one Pennant has figured as *tobianus* in British Zoology is the *lancea* of Cuvier, it remains to be ascertained to which of the species the American fish is to be referred, if indeed it belongs to either.—Neither Pennant nor Mitchill have favoured us with a description of the transatlantic lancee.

Fabricius considers the *putsrotok* of the Greenlanders to be the *Ammodytes tobianus*, and from the number of rays in its dorsal and anal being greater than in the *lancea* of Cuvier, it is probably the species represented by Bloch, pl. 72, f. 2. It frequents parts of the sea having sandy or clayey bottoms, in which it hides its head, and remains quiet with its tail pointing upwards and body spirally twisted. It rarely visits the surface, though it is occasionally observed swimming near pieces of ice, and in the month of May it approaches the beach in company with the capelins. It searches among the sand with its pointed snout for the worms upon which it feeds.

FINS.—Br. 7; D. 67; P. 14; V. 0; A. 34; C. 16. FABRICIUS.

## LOPHOBRANCHII.

IN this, the fifth order of fish according to Cuvier's arrangement, the jaws, as in the preceding orders, are complete and free; but the branchiæ, unlike those of other fish, are divided into little round tufts disposed by pairs along the arches: they are shut in by a large gill-cover bound down by a membrane, in which there is merely a small hole for the exit of the water, and only vestiges of rays. The *Lophobranchii* may also be known by their bodies being encased from one end to the other by shields which give them, in almost every instance, an angular form. They are generally of small size, and almost destitute of flesh. Their alimentary canal is even, without cæca, and their air-bladder slender, but large enough in proportion to the size of the fish. The order is divided into two genera, *Syngnathus* and *Pegasus*, the species of the latter being inhabitants of the Indian Ocean. *Syngnathus* is subdivided into three sub-genera, viz., the *Sea-pipes*, or *True syngnathi*, the *Sea-horses*, or *Hippocampi*, and *Solenostomus*, of which the only known species is an inhabitant of the Indian seas. Pennant mentions the Lesser pipe-fish, or *Syngnathus acus* of Linnæus, as belonging to North America, and Drs. Mitchill and Smith include *Syngnathus typhle* in their lists of the New York and Massachusetts fish. The peculiarity of the *syngnathi* carrying their roe after impregnation in little pouches under the belly or tail, which are cleft to give exit to the young when they are hatched, has been long known to naturalists, but Mr. Yarrell has recently shown that it is the male fish alone which is provided with these receptacles for the roe.

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## PLECTOGNATHI.

THE sixth order of osseous fish makes a near approach to the *Chondropterygii* in the imperfection of the jaws and the tardy ossification of the skeleton, which is nevertheless fibrous, and in its general structure the same as in ordinary fishes. Their principal distinctive character consists in the labials being joined immovably to the intermaxillaries which form the upper jaw, and in the arch of the palate being united by suture to the cranium, and consequently destitute of all motion. The gill-covers and rays are moreover concealed under a thick skin which leaves only a small branchial slit; there are no ribs; the true ventrals are wanting, the alimentary canal is wide, without cæca, and an air-bladder of considerable size is almost always present. The order comprises two very natural families, the GYM-NODONTES, which, instead of teeth, have their jaws armed with a substance like ivory, divided internally into plates, and having a general resemblance to the beak of a parrot; and SCLERODERMATA, which are readily known by a conical or pyramidal snout projecting from before the eyes, and terminated by a small mouth armed with a few distinct teeth in each jaw. Their skin is generally rough, or clothed with hard scales\*. The following species have been stated to frequent the coasts of the United States:—*Diodon punctatus*, CUVIER (*D. attinga*, SCHOEPP, *D. hystrix*, BL.); *D. rivulatus*, CUVIER (*D. maculato-striatus*, MITCHILL); *D. pilosus*, MITCHILL; *Tetraodon geometricus*, SCHNEIDER Bl.; *T. lineatus*, BL., SCHOEPP; *T. hispidus*, SCHOEPP; *T. turgidus*, MITCHILL; *T. levigatus*, WILLOUGH., SCHN. Bl.; *T. curvus*, MITCHILL; *Orthagoriscus mola*, SCHN. (*Tetraodon mola*, LINN., SCHOEPP); *Balistes tomentosus*, LINN.; *B. vetula*, BL.; *B. hispidus*, LINN., SCHN. Bl.; *B. monoceros*, LINN., PENN. (*Aleuterus monoceros*, SMITH); *B. aurantiacus*, SMITH; *B. broccus*, SMITH; *B. sufflamen*, SMITH; *Ostracion triqueter*, SMITH; *O. bicaudalis*, SMITH; *O. quadricornis*, SCHN., Bl. There is considerable confusion in the application of these names, some of them, at least, being preoccupied by fish belonging to other quarters of the ocean.

\* The *Plectognathi* are included by M. Agassiz among his *Ganoidians*.



## CHONDROPTERYGII ELEUTHEROPOMI.

## STURIONIDEÆ.

THE CARTILAGINOUS FISHES (those whose skeleton contains no bony fibres, but only small calcareous grains) are considered by Cuvier as forming a series parallel to the osseous fishes, in the same way that the marsupial animals represent the unguiculated mammalia. They are not, in his opinion, either inferior or superior in their organization to the osseous fishes, for many of the genera approach the reptiles in the structure of the ear and genital organs, while others show so much simplicity of form, and such imperfect vestiges of a skeleton, that one might even hesitate in ranking them among the vertebrated animals. The two orders into which the series is divided are characterised by the condition of the gills. The *eleutheropomi*\* resemble ordinary fishes in their gill-openings, which are furnished with a cover edged by a greatly-restricted membrane destitute of rays. This order comprehends only two genera or families, one of which, *acipenser* of Linnæus, or the *Sturionideæ*, is included by M. Agassiz along with the *plectognathi*, *syn-gnathi*, and fifty extinct genera in his order of Ganoidians; his Placoidians embracing the rest of the cartilaginous fishes. The following *Sturionideæ* have been mentioned by authors as existing in the waters of the United States. *Acipenser brevirostris*, LE SUEUR; *A. rubicundus*, ID.; *A. oxyrhynchus*, ID.; *A. maculosus*, ID.; *Plutirostra edentula*, ID.; *Polyodon spatula*, Règne Animal.

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[117.] 1. ACIPENSER TRANSMONTANUS. (Richardson.) *Columbia River Sturgeon.*

FAMILY, Sturionidæ. GENUS, Acipenser. AUCT. *Sub-genus*, Sterleta. BRANDT.

The *sturgeons* resemble the sharks in general form, but their bodies are defended by bony shields disposed in five, or in a few instances in three, longitudinal rows; their head is also well cuirassed externally; their toothless mouth, situated

\* *Donati operculis branchialibus liberis.* Lovetsky. *Eleuthéropomes.* Dumeril.

under the snout, is supported upon pedicles, which give it more protractility than the mouth of the sharks; the upper jaw, formed by the union of the palate-bones and labials, contains merely vestiges of the intermaxillaries; the eyes and nostrils are lateral; the snout is furnished beneath with barbels; there is no vestige of an auditory opening, the little hole behind the temples, which has been so considered, being, in fact, only a spiracle leading to the gills; the anal is under the dorsal, which is posterior to the ventrals; the caudal embraces the turned-up end of the spine, and has a broad lobe underneath anterior to the principal point. In this genus, as in the selacians, there is a conglomerated pancreas, and the lower part of the intestine is furnished with a spiral valve which serves to delay the passage of its contents. The sturgeons are anadromous fish, ascending rivers in shoals for the purpose of spawning. The migrations of some are confined entirely to fresh waters, others pass a part of the year in the sea. They are particularly abundant in the seas and rivers of northern Asia, and are of great importance, in an economical point of view, to the various nations under the Russian sway. Caviar is made from the roe, isinglass from the air-bladder, the flesh is eaten fresh, salted, or preserved by aromatic substances, and even the ligamento-cartilaginous cord which pervades the spine constitutes a Russian delicacy named *vesiga*.

The sturgeons of North America, though almost equally numerous with those of Asia, are of comparatively little benefit to the natives. A few speared in the summer time suffice for the temporary support of some Indian hordes, but none are preserved for winter use, and the roe and sounds are utterly wasted. The ingenious methods practised in Asia of capturing the sturgeon by weirs and moveable chambers are not resorted to in America, though west of the Rocky Mountains salmon are taken by analogous means, which we have already described. The northern limit of the sturgeon in America is probably between the 55th and 56th parallels of latitude. I have met with no account of its existence to the northward of Stuart's Lake, on the west side of the Rocky Mountains, and on the east side it does not go higher than the Saskatchewan and its tributaries. It is not found in Churchill River, nor in any of the branches of the Mackenzie or other streams that fall into the Arctic Sea, a remarkable circumstance, when we consider that some species swarm in the Asiatic rivers which flow into the Icy Sea. Sturgeon occur in all the great lakes communicating with the St. Lawrence, and also along the whole Atlantic coast of the United States down to Florida. Peculiar species inhabit the Mississippi, and it is therefore probable that the range of the genus extends to the Gulf of Mexico.

The sturgeon-fishery of Pine Island Lake, whose waters fall into the Saskatche-

wan, is most productive in the summer, a stray individual being very rarely taken at other seasons. The sturgeons make their first appearance when the river breaks up in the spring, and the lake is flooded with muddy water. The great rapid which forms the discharge of the Saskatchewan into Lake Winipeg, appears quite alive with these fish in the month of June, and some families of the natives resort thither at that time to spear them with a harpoon, or grapple them with a strong hook tied to a pole. Notwithstanding the great muscular power of the sturgeon it is timid, and we have seen one so frightened by the paddling of a canoe, that it ran its nose into the muddy bank, and was taken by a voyageur, who leaped upon its back. The Saskatchewan sturgeon weighs from ten to twenty pounds, and rarely attains the weight of sixty. June is the principal spawning time, but individuals filled with roe have been killed in every season of the year. As this fish is not taken near Hudson's Bay, it is probable that it winters in Lake Winipeg without visiting the sea, though we are not aware that there are any cascades in Nelson's \* River which it cannot surmount. On comparing a number of these sturgeons with one another, considerable variety was perceived in the length and acuteness of their snouts, and in the intensity of the colour of their bodies: the older fish had smoother and flatter shields. I brought home specimens of the two most distinct kinds in 1821, and on drawing up a few hasty notices of the fish for the Appendix to the Narrative of Sir John Franklin's First Expedition, followed the opinion of Forster in considering them to be specifically the same with the *acipenser Ruthenus*, or sterlet of the Russian rivers. The specimens having gone to decay, I have no means of correcting this reference, which is doubtless erroneous. As far as I can recollect, the Saskatchewan sturgeon, known to the Crees by the name of *nameyoo*, is very similar to one which exists on the west side of the Rocky Mountains, which I shall now allude to more particularly.

Two specimens of a sturgeon, which I have named *acipenser transmontanus*, were sent to me from Fort Vancouver by Dr. Gairdner, accompanied by the following notice:—"The species attains eleven feet in length, and a weight of six hundred pounds †; the small specimens sent home were chosen for their portability. It enters the Columbia early in March every year, and is caught as high up as Fort Colville, notwithstanding the numerous intervening cataracts and rapids, which seem to be insuperable barriers to a fish so sluggish in its movements.

\* The Saskatchewan loses its name when it falls into Lake Winipeg, whose superfluous waters are carried to Hudson's Bay by Nelson's River.

† The *huvo* is reported by Pallas to attain a weight of nearly three thousand pounds, and a length exceeding thirty feet.

It disappears about the month of September. It is termed by the Cheenooks *katlook*, and in the language of the Cascade Indians *nakhun*."—The Columbia River sturgeon belongs either to the *sturiones* or *sterletæ*, two of the four groups into which Brandt has divided the genus, the approximation or remoteness of the shields by which these two forms are characterised not being very precise as a practical mark of distinction\*. Its snout is broad as in the Common sturgeon *A. sturio*, but much more depressed, and its mouth is comparatively large. In its general form and proportion of parts it strongly resembles *A. Ruthenus*, but whether it be the same with the sturgeon of Stewart's Lake and Frazer's River, noticed in page 215, we have no means of ascertaining.

## DESCRIPTION

Of No. 1, specimen of *A. transmontanus* from the Columbia River.

FORM elongated, tapering from head to tail, the *body* keeled by five rows of shields, the dorsal row being the most prominent, and the lateral one least so; the belly and under surface of the head are flattish; the cheeks are also flat, and the snout rounds off laterally from the nostrils, terminating in a moderately-acute point; the top of the *head* is slightly convex, both longitudinally and transversely, with a shallow depression extending from between the orbits backwards on the mesial line; the profile shelves off suddenly before the nostrils into the greatly-depressed *snout*, which, when seen from above, is semilanceolate, its breadth at the nostrils being equal to its length anterior to these openings; in profile the snout appears thin and horizontal, but its flexible point is readily turned up a little. Two pairs of slender, tapering *barbels*, quite simple at their tips †, hang from beneath the snout about midway between its point and the orbit; the exterior pair, which are a little posterior to the others and rather longer, measure an inch and a half. A bone, forming a narrow, even, flat ridge, is perceptible through the skin covering the under surface of the snout, and terminates abruptly opposite to the anterior margin of the orbit, on the verge of the large cavity in which the mouth is lodged. The snout, if measured from the orbits, forms one-twelfth of the total length of the fish, but less than one-fifteenth if measured only from the nostrils. The *mouth* is posterior to the eye, and when protruded has an oval orifice, whose axis lying transversely mea-

\* Professor Lovetsky, adopting Brandt's subdivision, has given the following arrangement of the species known to him:—

1. *HUSONES*.—Snout acute or obtuse, wholly or partly cartilaginous, more or less pellucid; shields which arm the body distant from one another. *A. huso*, LINN.; *A. husoniformis*, LOVET.; *A. dawricus*, GEORG.; *A. obtusirostris*, LE SUEUR; *A. rubicandus*, LE SUEUR.

2. *STURIONES*.—Snout obtuse or awl-shaped, covered with bony shields not pellucid; shields distant. *A. Guldenstädtii*, BRANDT; *A. sturio* (*A. Lichtensteinii*, SOHN., Bl.); *A. schipa*, GULDENST.; *A. Geckelii*, FILX.

3. *STERLETÆ*.—Snout awl-shaped, covered with bony shields, not pellucid; shields imbricated. *A. Ruthenus*, LINN.; *A. aculeatus*, FISCHER.

4. *HELOPES*.—Snout long (one-sixth or one-seventh of the length of the body), covered with strong bony shields; shields distant. *A. stellatus*, PALL.; *A. oxyrhynchus*, MITCH.; *A. maculosus*, LE SUEUR. (LOVETSKY, *Nouv. Mém. de Moscou*, iii., p. 257. An. 1834.)

† The barbels of *A. Ruthenus* have fringed tips.

sures an inch and a half, or nearly as much as the distance between the anterior nostrils and the tip of the snout: when the jaws are retracted the commissure of the mouth is transverse, and is drawn considerably within the under surface of the head. The lips, thin and pendulous at the junction of the jaws, are separated by a fissure on the medial line of the upper jaw, and are altogether wanting on the middle half of the lower jaw. The *tongue* is fixed, prominent, and smooth, and there are no teeth whatever. The *orbits* are small and circular and the nostrils large, particularly the posterior openings. Four lengths and a half of the head are equal to the entire length of the fish.

The GILL-COVER consists of a pretty large operculum, which has a form more like that of *A. schipa* than any of the other figures in Lovetsky's monograph\*: a chain of three smaller bony plates proceeding from the lower corner of the operculum gives firmness to the gill-membrane, which is not to be distinguished from the softer parts of the gill-cover.

SKIN.—The whole upper surface of the head is encased in bony plates of various forms, which are rough, with radiating, granulated ribs: the plates on the snout admit of a little motion, the others are fixed; a few small ones exist on the tip of the bone beneath the snout, and farther back rises into two tubercles. The suborbital bones, humerals, and scapulars, have surfaces still more rough than the upper plates, in conjunction with which they form a firm helmet that compensates for the too great flexibility of a cartilaginous cranium. The *shields* on the body have rough saddle-shaped bases, with very acute central ridges terminating in a hook or spine which points backwards, and is longest and most acute on the posterior dorsal shields; there are also some serratures on the ridge of the shields beneath the point of the spine. The *dorsal row* contains fourteen shields, exclusive of one without a spine, which is incumbent on the first ray of the dorsal fin: the anterior of these shields is fixed among the plates of the head, the others move with the skin, and are near each other, though not in actual contact. The shields on the *lateral lines* have lozenge-shaped bases, placed obliquely, and are smaller and farther apart than the dorsal ones anteriorly, but the posterior ones successively diminish and approximate until they reach the curvature of the tail, beyond which they cannot be easily reckoned, though they can be traced in form of a cartilaginous line extending along the under margin of the tail to its tip: excluding the extreme caudal ones, then, there are in this specimen forty-two lateral shields on the left side, and forty-seven on the right. The *ventral shields*, of which there are eleven on the left side, and nine on the right before the ventrals, are wider apart than the lateral ones, and of an intermediate size between them and the dorsal ones. There are also five or six sub-orbicular, spineless plates in two rows, between the vent and anal fin, one on the commencement of the latter, and another on the upper ray of the caudal. The compressed, turned up part of the tail is covered above the lateral line by ten or eleven crowded rows of small, rough, lozenge-shaped plates, which give it a reticulated appearance. The rest of the skin is studded with small, scattered, stellated tubercles of various forms and sizes; some exist even on the

\* In Professor Lovetsky's monograph on Russian sturgeon, no statement is given of the parts that are included under the name of snout, so that we cannot compare the length of this member in our fish with that of his.

lining of the gill-openings, the skin surrounding the eye and nostrils being the smoothest. There is a short, smooth groove on the under edge of the tail, between the caudal and anal fins, the use of which is not apparent.

FINS.—*Br.* 0; *P.* 43; *V.* 34; *D.* 52; *A.* 33; *C.* 27/86.

The *pectorals* have a greater spread than any of the other fins; their first ray is very strong and bony, its slender tip, however, being articulated. The *ventrals* are far back, being nearer to the tip of the tail than to the end of the snout: they have a horizontal position, which, in conjunction with the size of the pectorals, and the position of the mouth, shows that the fish is constructed for taking its prey on or near the bottom of the water. The *anal* begins as far from the vent as its termination is from the caudal: its middle rays are the longest. The *dorsal* commences a little posterior to the vent, and terminates a very little anterior to the end of the anal. The portion of the caudal above the tail gradually narrows and disappears short of the point; its rays are rigid and bony, or spinous with very acute points. The under part of the fin is considerably broader, particularly its anterior lobe; its margin is sickle-shaped, and its rays are articulated like those of the other fins. The rays of all the fins are very rough. There are seventeen interspinous bones connected with the dorsal, and eleven with the anal.

COLOUR.—“Body and top of the head of a hue intermediate between yellowish and bluish-grey, partially iridescent; shields ash-grey, giving a spotted appearance to the back. Sides silvery-white, with faint vertical bluish-grey bands. Belly white.” (Gairdner.)

INTESTINES.—The œsophagus, or upper part of the stomach, is furnished with seven longitudinal rows of crenated papillæ; the rest of the stomach is smooth, with thin coats forming longitudinal folds, except close to the pylorus, where the parietes of the stomach are thick and fleshy, like the gizzard of a fowl. The upper half of the gut, below the pylorus, has its lining finely reticulated, and the remainder is traversed by a spiral membranous valve. A little below the pylorus there is a glandular-looking pancreas which communicates with the gut; when laid open it appears to consist of honey-combed cells, much resembling the second stomach of a ruminating quadruped. The air-bladder communicates with the upper part of the stomach by a pretty large hole. The stomach was filled with the remains of some nearly-digested *malloti pacifici*, mixed with the light wrack that collects in the eddies of rivers, such as decayed leaves, water-worn pieces of wood, and the exuvix of the larvæ of neuropteræ.

The *second specimen* has a longer and rather more acuminate snout, twelve dorsal shields, forty-two and forty-three lateral ones, and twelve ventral ones on each side. There are also a few roundish plates ranged near the bases of the dorsal shields. In other respects it resembles the preceding ones perfectly.

## DIMENSIONS.

	No. 1,		No. 2.		Dr. Gairdner's measurement.	
	In.	Lin.	In.	Lin.	In.	Lin.
Length from tip of snout to extremity of tail . . . . .	27	0	23	6	54	0
" " curvature of tail (excluding caudal) . . . . .	22	6	19	2	45	0
" " end of dorsal . . . . .	19	8 $\frac{1}{2}$	17	0	39	0
" " end of anal . . . . .	19	6	17	3	38	9 $\frac{1}{2}$
" " beginning of dorsal . . . . .	17	1	14	9 $\frac{1}{2}$	33	0*
" " anus . . . . .	15	9 $\frac{1}{2}$	14	2	33	0
" " end of ventrals . . . . .	15	0	13	7 $\frac{1}{2}$	0	0
" " beginning of ditto . . . . .	14	0	12	7 $\frac{1}{2}$	29	0
" " nape including first dorsal shield . . . . .	6	2	6	0	0	0
" " nape excluding ditto . . . . .	5	3	5	2	11	0
" " pectorals . . . . .	5	9	5	9	12	0
" " posterior edge of gill-openings . . . . .	5	9 $\frac{1}{2}$	5	8	0	0
" " edge of operculum . . . . .	5	7	5	4 $\frac{1}{2}$	10	1
" " temporal spiracles . . . . .	3	10	3	8	6	7
" " posterior edge of orbit . . . . .	2	8 $\frac{1}{2}$	2	10 $\frac{1}{2}$	0	0
" " anterior ditto . . . . .	2	3 $\frac{1}{2}$	2	6	0	0
" " posterior end of vomer . . . . .	2	4 $\frac{1}{2}$	2	6 $\frac{1}{2}$	0	0
" " angle of posterior sub-orbital . . . . .	3	2	3	3 $\frac{1}{2}$	0	0
" " superior nasal orifices . . . . .	1	8 $\frac{1}{2}$	1	9 $\frac{1}{2}$	2	7
" of pectorals . . . . .	4	0	3	4	7	0
" ventrals . . . . .	2	2	1	7	4	4
" attachment of ditto . . . . .	1	2	1	0	0	0
" attachment of anal . . . . .	1	4	1	0	2	8
" its longest rays . . . . .	2	4	2	0	4	0
" attachment of dorsal . . . . .	2	7 $\frac{1}{2}$	2	2	6	0
" its longest rays . . . . .	2	3	1	8 $\frac{1}{2}$	3	0
" longest lower rays of caudal . . . . .	3	0	2	7	0	0
" lower lobe of ditto . . . . .	3	6	3	1	5	0
" upper lobe of ditto . . . . .	5	10	5	2	0	0
Breadth of pectorals . . . . .	2	9	2	7	5	5
" between nostrils—upper orifices . . . . .	1	2	1	2	2	5
" between eyes . . . . .	1	9 $\frac{1}{2}$	1	9	3	6
" between anterior orbital bones . . . . .	2	0	1	10	3	9
" between temporal spiracles . . . . .	2	0	1	10	3	9
" between surfaces of scapular bones . . . . .	2	7	2	4	0	0
Circumference of body where thickest . . . . .	9	0	8	0	18	0

[118.] 2. ACIPENSER RUBICUNDUS. (Le Sueur.) *Ruddy sturgeon*.

*Acipenser rubicundus*. LE SUEUR, *Ph. Tr., Philad.*, New Series, i., p. 388, pl. 12.

This sturgeon, which was very imperfectly known to Pennant and other writers who have mentioned Canadian animals, was first established as a distinct species by M. Le Sueur, who found it in lakes Ontario, Erie, Huron, and Michigan. The individuals inhabiting the three latter sheets of water are of course cut off

\* This measurement was probably made by Dr. Gairdner to the anterior edge of a shield incumbent on the dorsal which is nearly opposite to the posterior verge of the vent.

from all communication with the sea by the falls of Niagara, and even the sturgeon of Lake Ontario do not perhaps descend the St. Lawrence, as I have no notices of their having been taken in the lower parts of that river. La Hontan says "the lake sturgeons are commonly five or six feet long, but I once saw one of ten feet, and another of twelve. They are caught by the savages with nets in the winter and grapples in the summer." August is termed the sturgeon month by the Canadian Indians, on account of the productiveness of the fishery at that period. Carver states that sturgeon of excellent quality may be taken in Lake Superior at almost all seasons of the year, but whether they are of the same species with the ruddy sturgeon we have no means of judging. The latter is remarkable for wanting the abdominal shields, agreeing in this respect with the *A. nudiventris* of Lake Aral, which Professor Lovetsky considers to be a variety of *A. schipa*. This author refers *A. rubicundus* to the sub-genus *sturio*, in which the shields are remote and the opaque snout is protected by strong bony plates. It is described by M. Le Sueur as having

A yellowish-red colour on the back, and olivaceous-red on the sides. Its head, which forms one-eighth of the total length, is flat above with a roundish snout, having its four barbels nearer to its tip than to the mouth. The breadth at the eyes is equal to the distance from thence to the end of the snout, which in a fish four feet long is only three inches. The dorsal ridge is much elevated at its junction with the nape. There are nine dorsal shields and thirty-five lozenge-shaped lateral ones. FINS.—*P.* 50; *V.* 28; *A.* 22; *D.* 42. (LE SUEUR, *l. c.*)

[118.]

CHIMÆRA. — *Elephant fish.*

Elephant fish. VANCOUVER.

The *chimæra*, though placed by Cuvier at the end of the *sturionidæ*, seem to belong more properly to his second order of *chondropterygii*, in which the gills are fixed, for though there is only one apparent gill-opening on each side, the gills in reality adhere by a large part of their borders, and there are consequently five holes communicating with the external gill-opening. They have, moreover, a great resemblance to the sharks in their general form and the position of their fins. They have a rudimentary operculum concealed by the skin, and their jaws, still more reduced than those of the sharks, are furnished with hard plates, four above and two below, in place of teeth. The projecting snout is marked with rows of pores. The males are distinguished by trifid bony appendages to the ventrals, and they



have also two spinous laminæ in front of these fins, and a fleshy barbel between the eyes, terminated by a cluster of prickles. The gut is short and straight, with a spiral valve as in the sharks. These fish produce very large leathery eggs, having flat velvety edges\*. The only two species known to Cuvier were placed by him in separate sub-genera. The *Chimera monstrosa*, or king of the herrings, inhabits the European seas, where it preys on fish that migrate in shoals. The *Callorhynchus antarcticus* frequents the southern seas. The researches of Mr. Collie, during Captain Beechey's recent voyage, render it probable that several undescribed species exist in the Pacific. One was seen at Coquimbo, on the coast of Chili, and another at Monterey, in California, possessing characters intermediate between *Chimæra* and *Callorhynchus*. Another, inhabiting the northern parts of the Pacific, is described in the Appendix to the Narrative of the Voyage alluded to by Mr. Bennet, under the name of *chimæra Colliei*. An elephant fish, taken by Vancouver in Port Discovery, lat. 48°, in the Straits of Juan da Fuca, may possibly belong to this species.

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\* Captain King says that the spawn of *Callorhynchus* bears a strong resemblance to a broad leaf of sea-weed, within the coats of which the fish, already perfect in form, is discovered suspended in fluid. Griffith's Cuvier, x., p. 97.

## CHONDROPTERYGII TREMATOPNEONTES.

THE CARTILAGINOUS FISHES with FIXED GILLS, forming the eighth order of their class in Cuvier's arrangement, are the *trematopnès* of Dumeril, or the *placoidians* of M. Agassiz. Their gills adhere by their outward edges in such a way that the water either escapes by as many holes in the skin as there are intervals betwixt them, or by a common conduit in which all these holes end. Another peculiarity in the structure of these fishes consists in the frequent suspension of small cartilaginous bows in the flesh opposite to the gills, and which may be called branchial ribs. The order is divided into two families.

## SELACHII.

The *sélaciens* of Cuvier, or *plagiostomes* of Dumeril, comprise the *sharks* and *rays*, which have many common characters. They have the ordinary jaw bones merely in a rudimentary state, their place being supplied by the palatine and post-mandibular bones, which are alone armed with teeth, and are suspended to the cranium by a single bone, that represents at once the petrous, jugal, and temporal bones and the preoperculum. The gill-rays are attached to the os hyoides, as in osseous fishes, although they are not so perceptible externally, but there is no vestige of any of the three opercular pieces. The ventrals are situated on the hinder part of the abdomen on each side of the vent. The pancreas is in form of a conglomerated gland, and not divided into distinct cæca, and the short gut is provided in its lower part with a spiral valve. These fish are either oviparous or viviparous, and possess well-organised oviducts. The males have curious appendages on the inside of their ventral fins, whose use is not known. The following species have been mentioned as inhabitants of the seas of the United States.

SCYLLII.—*Scyllium Edwardsii*, CUV. (*Squalus canis*, MITCHILL; *S. canicula et catulus*, SMITH). CARCHARIÆ.—*Squalus carcharias*, PENN., MITCHILL, SMITH; *Carcharias vulpes*, SMITH (*Squalus vulpes*, MITCHILL); *Squalus glaucus*, MITCHILL, SMITH; *Squalus punctatus*, IDEM; *Squalus obscurus*, LE SUEUR; *Squalus littoralis*, IDEM. SELACHES.—*Selache maximus*, SMITH (*Squalus*

*maximus*, MITCHILL; *Squalus elephas*, LE SUEUR). SCYMNI.—*Squalus Americanus*\*, MITCHILL; *Somniosus brevipinnis*, LE SUEUR. ZYGÆNÆ.—*Zygæna malleus*, VALENC. (*Zygæna vulgaris*, SMITH; *Squalus zygæna*, MITCHILL); *Zygæna tiburo*, SMITH (*Squalus tiburo*, PENN.). SQUATINÆ.—*Squatina Dumérilii*, LE SUEUR. PRISTES.—*Squalus pristis*, PENN. RAIÆ.—*Raia torpedo*, *ocellata*, *diaphana*, *centroura*, and *bonasus*, MITCHILL; *Raia batis* and *clavata*, SMITH; *Raia Sayii*, *Desmarestii*, *eglanteria*, *Chantenay*, LE SUEUR; *Trygon Sabinum*, CUV. (*Raia Sabina*, LE SUEUR); *Trygon micrura*, CUV. (*Raia Macrura*, LE SUEUR); *Myliobatis Fremenvillii*, LE SUEUR; *Myliobatis quadriloba*, CUV. (*Raia quadriloba*, LE SUEUR). CEPHALOPTERÆ.—*Cephaloptera mobular*, CUV. (*Ceph. giorna*, LE SUEUR; *Cephaloptera vampyrus*, MITCHILL. Devil ray, PENN.). From the imperfect descriptions of many of the above fish, and the want of figures, we cannot be certain of the right application of the names.

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[119.] 1. SQUALUS (CARCHARIAS) VULGARIS. (Cuvier.) *The White shark.*

White shark. PENN., *Arct. Zool.*, *Suppl.*, p. 105.

The *sharks* constitute an extensive genus, which is known by the elongated body, thick fleshy tail, and pectorals of medium size, so that in their general form they are not widely different from ordinary fishes. Their gill-openings and eyes are lateral, their snout is sustained by three cartilaginous branches proceeding from the forepart of the cranium, and their rudimentary intermaxillaries, labials, and premandibular bones are readily discernible. Many of them are viviparous, others oviparous. The spine is divided throughout into vertebræ, and the small ordinary ribs, as well as the branchial ribs, are apparent. The sub-genera are characterised principally by the form of the snout and nostrils, the presence or absence of spiracles on the top of the head, the extent of the gill-openings, the number and position of the dorsal fins, the existence of spines before these fins, the presence or absence of the anal, and the form of the teeth, which are either cutting or *en pavès*. The *carchariæ*, a most celebrated and numerous group, have sharp

\* It is probable that this is not the *Squalus Americanus* of Gmelin, which is a European species wrong named, from his mistaking Cape Breton, near Bayonne, for the island of Cape Breton, in the entrance of the Gulf of St. Lawrence.—*Règne Animal*.

cutting teeth, most generally serrated on the edges, their first dorsal is considerably before the ventrals, and the second one opposite to the anal. They are destitute of spiracles, the nostrils are under the middle of the depressed snout, and the posterior gill-openings are over the pectorals. The Common or White shark, the terror of all seas, attains the length of thirty feet, and may be recognised by its teeth, which, in the upper jaw, are in form of an isosceles triangle with rectilinear sides and jagged or serrated edges; in the lower jaw they have a narrow point upon a broader base. The rows of teeth are said to increase with the age of the fish, which, when adult, has six distinct ranges, the outer teeth being then two inches and a half long. This shark has a flat head, and a round depressed snout projecting beyond the mouth, which is underneath the head. The pectoral fin is large, as it very frequently is in fishes which have large heads and mouths so situated.

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[120.] 2. SQUALUS (CARCHARIAS) TERRÆ-NOVÆ. (Richardson.)  
*Newfoundland Shark.*

Green-backed shark (*Squalus punctatus*). MITCHILL, i., p. 483?

I am indebted to Mr. Audubon for a small and apparently young specimen of this shark. It is closely allied to the *carcharias glaucus* by the form of its teeth, which are not however serrated, at least in the young state, and its pectorals cannot be said to be very long and much pointed like those of the Blue shark. The Green-backed shark of Mitchill agrees with ours in the teeth not being serrated, but his description is not particular enough to enable us to say that they are the same species.

DESCRIPTION

Of a specimen taken at Newfoundland.

FORM.—*Head*, and particularly the snout, broad and depressed, the latter rounded at the tip: the breadth of the head between the eyes is about half its length, and at the nape about two-thirds. The body tapers considerably, is much compressed posteriorly, and the tail, exclusive of the fin, is thin and narrowly lanceolate. There is a narrow, oblong, flattened space between the second dorsal and caudal, which, in the *squalus glaucus*, is said to be triangular; a similar flat space extends from the anal to the under lobe of the caudal, and there is a broader and somewhat triangular one between the ventrals and anal. The *pectorals*, rather larger than the first dorsal, have, like it, nearly the form of a latteen sail, but the latter fin has

a little slip at its posterior end higher than the portion immediately preceding it. The ventrals, second dorsal, and anal are small, and the two latter have each a posterior slip, taller in proportion than that of the first dorsal. The origin of the second dorsal corresponds with the end of the anal. The ventral appendages are semicylindrical, covered with the common integuments exteriorly, and terminated by a minute, hard, callous tip. The tail at the origin of the caudal inclines a very little upwards. The anterior under lobe of the caudal is as high, but not so wide, as the first dorsal: it is connected by an even fillet of fin about twice as long as itself, to the second lobe, which uniting with the upper portion of the caudal forms an oblong lanceolate tip to the tail; the upper half of the caudal is widest at the extremity, and gradually becomes lower as it runs forwards, being no longer perceptible a little posterior to the commencement of the under part of the fin.

**SKIN.**—The whole exterior of the fish, including the fins, feels rough when rubbed towards the snout. On examining a portion of the skin with a powerful microscope, it is observed to be completely encrusted by a congeries of small, hard, transparent, lancet-shaped, tricuspid spines or scales imbedded in a fibrous matter. The roughness extends to the anterior half of the tongue and palate, and to portions of the branchial arches. There are several rows of minute pores on the head, particularly on the cheeks and at the angles of the mouth. Two pores larger than the others, but not capable of admitting the point of an ordinary-sized pin, exist on the hind part of the head, one on each side of the mesial line. There are no traces of spiracles near the eyes.

**TEETH.**—There are four rows of teeth in each jaw, having the form of very oblique spherical triangles, the posterior side much the shortest, and the acute point directed towards the corners of the mouth, and overhanging a small rounded lobe of the base. The edges of the teeth are very acute, but even under a good lens do not appear dentated or serrated, though a slight inequality, approaching to crenature, may be perceived with a high magnifying power. There is scarcely any difference in the form of the teeth of the two jaws.

## DIMENSIONS

Of a specimen kept in spirits.

	Inches.	Lines.		Inches.	Lines.
Length from tip of snout to extremity of tail	12	9½	Gape of mouth longitudinally . . . . .	2	2
" " beginning of lower part of caudal . . . . .	9	0	" " transversely (from corner to corner)	0	9½
" " end of second dorsal . . . . .	8	0	Length of pectorals . . . . .	1	8
" " end of anal . . . . .	7	8	Spread of ditto . . . . .	1	0
" " anus . . . . .	6	0	Height of dorsal . . . . .	1	1
" " end of first dorsal . . . . .	5	0	Length of its attachment . . . . .	1	0½
" " beginning of ditto . . . . .	4	0	" " ventrals . . . . .	0	5
" " last gill-opening . . . . .	2	9½	" " ventral appendages, interiorly . . . . .	0	7½
" " base of pectorals . . . . .	2	8½	" " attachment of anal . . . . .	0	6
" " foremost gill-opening . . . . .	2	2½	Height of anal . . . . .	0	3½
" " nape . . . . .	1	9½	Length of attachment of second dorsal . . . . .	0	4
" " angles of mouth . . . . .	1	9½	Height of anterior, under caudal lobe . . . . .	0	11
" " middle of upper lip . . . . .	1	1	Length of second lobe . . . . .	0	10
" " centre of eye . . . . .	1	3	Distance between the lobes . . . . .	1	9
" " nostrils . . . . .	0	8	Total length of caudal fin beneath . . . . .	3	9½
			" " " above . . . . .	3	6½

[121.] 1. SQUALUS (SELACHE) MAXIMUS. (Cuvier.) *The Basking Shark.*

*Squalus maximus.* FABR., *Faun. Grœnl.*, p. 130.

This sluggish shark acquires the name of "basking" from its habit of lying motionless on the surface of the water. Notwithstanding its great size it is not ferocious like the White shark, and is little dreaded by man. Fabricius says that it feeds on the smaller whales and dolphins, which it swallows entire. It is named *Kaksib kannioa* by the Greenlanders, and is a very rare fish on the Greenland coast. It has, in addition to the general form of the *carchariae*, spiracles, long gill-openings almost encircling the neck, and small conical teeth not serrated.

[122.] 1. SQUALUS (SPINAX) ACANTHIAS. (Cuvier.) *Piked Shark, or Dog fish.*

*Squalus acanthias.* FABR., *Faun. Grœnl.*, p. 126.

This species, so common on the coast of Scotland, where it is named the "Picked or Piked Dog," from the strong spine at the beginning of each dorsal, is said by Fabricius to be an inhabitant of the Greenland coast also. It is named *kookeeleek* by the natives, who fish for it in the winter time through holes in the ice. The fish of this sub-genus want the anal, but possess spiracles, and their jaws are armed with many rows of small cutting teeth. Lieutenant-Colonel Hamilton Smith informs me that he has taken the Common dog-fish of the English Channel on the coast of Nova Scotia.

[123.] 1. RAIJA FULLONICA. (Linn.) *The Fuller.*

FAMILY, Selachii. CUV. GENUS, Raia. LINN. Sub-genus, Raia. CUV.  
*Raia fullonica.* FABR., *Fauna Grœnl.*, p. 125.  
*Taraleekoosak, Aglernak.* GREENLANDERS.

The Common skate furnishes a characteristic example of the peculiar form of the rays, in which the greatly-depressed body is extended laterally by the addition

of wide fleshy pectorals that unite anteriorly with one another, or with the snout, and stretch backwards along the sides of the belly as far as the ventrals. The eyes and spiracles are on the dorsal aspect, the mouth, nostrils, and gill-openings on the ventral one. The dorsal fins are most generally situated on the tail. Their brown leathery eggs have a square form with projecting points at the angles.

The *fuller ray* receives its name from the resemblance of its spiny back to the instrument used in dressing cloth. It is called on the Yorkshire coast *white hause*, from the colour of its throat. Fabricius mentions it as an inhabitant of the deeper southern bays of Greenland, but he is not quite certain whether the fish he describes be the same with that of all the various authors whom he quotes. Indeed, Cuvier remarks that the references of Artedi, Linnæus, and Bloch, in respect to the rays, must be altogether disregarded, as they are in inextricable confusion, arising from the number of rows of caudal spines being considered a principal character, though they vary with age and sex, and cannot therefore distinguish species. Characters founded upon the roundness or sharpness of the teeth are equally vague and uncertain in their application. There are doubtless many fish of this genus on the Newfoundland coast; but from the circumstances just mentioned the species cannot be quoted with any approach to correctness.

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#### CYCLOSTOMATA.

THE *suckers* of Cuvier, or *cyclostomes* (round mouths) of Dumeril, forming the second family of the cartilaginous fish with fixed gills, have the most imperfect skeletons, not only of their own class, but of all vertebrated animals. Indeed, they approach the *annelidæ*, both in external appearances as well as in many details of structure, some of them closely resembling leeches, and others being more like the red-blooded worms, so that some naturalists have doubted their right to be classed with fish\*. Their fleshy circular, or semicircular lip, placed at their anterior extremity, is supported by a cartilaginous ring, formed by the union of the palatine and mandibular bones. The vertebræ are merely incomplete cartilaginous rings, scarcely distinct from each other, and pervaded by a tendinous chord which con-

\* Sir Everard Home considers the Lamprey and Myxine as intermediate between the fishes and vermes, and remarks that they are hermaphrodites, and have much analogy in their mode of respiration with the leeches and the *aphrodita aculeata*. (*Phil. Trans.*, June, 1815, p. 256.) The *Ammocetes* inhabit the mud of streams, and resemble worms still more than the fish Sir Everard Home mentions. They may be said to have no skeleton whatever.

tains a mucilaginous matter. There are no ordinary ribs, but the branchial ribs are much developed, forming a sort of chest for containing the gills, which, in place of having the usual appearance of leaves, or combs, are united each to the adjoining one so as to form oval bags. The nostrils open by a single orifice, in front of which there is the entrance to a blind cavity, that has been erroneously considered as an air-hole or spiracle. The gut, slender and straight, is furnished with a spiral valve.

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[124.] 1. PETROMYZON TRIDENTATUS. (Gairdner.) *Tridentate*  
*Lamprey.*

FAMILY, Cyclostomata (*Lee succeus*). CUV. GENUS, Petromyzon. CUV., LINN.  
Petromyzon tridentatus. GAIRDNER, *in lit.*  
Squaqual. INDIANS of the banks of the WALAMET.

The *lampreys* have seven gill-openings on each side; their maxillary ring is armed with strong teeth, and the inner surface of the circular lip is likewise provided with tubercles encrusted by a hard shell and resembling teeth. The tongue, furnished with two longitudinal rows of little teeth, works backwards and forwards like the sucker of a pump. The water passes from the mouth to the gills by a membranous tube situated under the œsophagus and pierced by lateral holes. There is one dorsal fin anterior to the anus, and another behind it which unites with the caudal; the latter looks like a mere fold of the skin, its rays being fine fibres that are scarcely perceptible. These fishes adhere strongly to stones and other bodies by their mouth, and also to fishes, the largest of which they can destroy by draining them of their fluids. Three species are described as European, viz., the *P. marinus*, *fluvialis*, and *planeri*, the two former of which are mentioned by Mitchill and Smith as inhabitants of the United States waters.

The *tridentate lamprey* abounds at the falls of the Walamet, which we have already had occasion to say is one of the tributaries of the Columbia. Dr. Gairdner gave it the name of *tridentatus*, from the upper side of its maxillary ring being armed with three conspicuous and contiguous teeth, of which the middle one is the smallest. It resembles *P. marinus* and *fluvialis* in the dorsals being distinct.

DESCRIPTION.

MOUTH broadly oval, its axis parallel to that of the body. The thick obtuse lips are furnished with a circular row of small nipple-like papillæ, about fifty-six in number, each standing in the



middle of little circular depressions having a raised margin, which are partly concealed by a rugose, tessellated plate, investing the inner surface of the lips, and of the same horny nature with that which forms the outside of the teeth,—both are softened and peel off when the specimen is kept immersed in spirits. Four small, acute, conical teeth stand in a row across the upper part of this plate, and four larger ones occupy each of its sides, the upper and lower pairs being bicuspid, and the middle ones tricuspid: these stand on the sides of the maxillary ring, or inner orifice, and have their ends turned towards it; the inferior margin of this orifice is armed with a slightly-curved dental piece, having five acute points or teeth; and opposite to it, on the upper side of the orifice, is another piece, having two large, acutely-conical lateral teeth, with a smaller central one. The tongue is also clothed with a horny-looking substance, which is edged anteriorly by a row of about twenty fine teeth.

The *dorsal fins* rise in even curves which are highest in the middle; the first one is about one-third of its own length distant from the second one, which unites with the caudal, the point of junction being marked by a depression. A fold of skin becomes perceptible on the under edge of the tail, a short way behind the anus, and gradually expands into the lower caudal lobe towards the tip of the tail, where its height, in conjunction with that of the upper lobe, equals the greatest height of the second dorsal.

COLOUR.—“Back and sides bluish-grey with irregularly-scattered yellowish patches. Belly yellowish-white.” (Gairdner.)

		DIMENSIONS.			
		Inches.	Lines.	Inches.	Lines.
Length from tip of upper lip to extremity of caudal fin		21	6	Length of space between 1st and 2nd dorsal fins	1 0
” ” end of second dorsal		20	1	” upper lobe of caudal	1 6
” ” anus		15	5	Height of both lobes of caudal	0 10
” ” origin of second dorsal		14	11	” first dorsal	0 4½
” ” end of first dorsal		13	11	” second dorsal	0 10
” ” origin of ditto		10	8	Length of axis of mouth	1 2
” ” last gill-opening		4	10	” its transverse diameter	0 9
” ” first ditto		2	8	” diameter of inner orifice of maxillary ring	0 5
” ” centre of eye		1	8	Distance between the eyes	0 9½
” of first dorsal		3	3	Greatest circumference of body	4 6
” second ditto		5	2		

[125.] 2. PETROMYZON FLUVIALIS. (Linn.) *River Lamprey.*

*Petromyzon argenteus.* BLOCH, t. cccxv., f. 2.

*Petromyzon fluvialis.* RICHARDSON, *Frank. First Journ.*, p. 705.

A lamprey having teeth like *fluvialis* was found in Great Slave Lake adhering to an Inconnu (*Salmo Mackenzii*). It was very like Bloch's figure above referred to, which Cuvier thinks is not different from *fluvialis*.

## ADDENDA.

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Page 43, before *Cottus polaris*.

[126.] 2<sup>(bis)</sup> COTTUS ASPER. (Richardson.) *Prickly Bull-head*.

I AM indebted to Dr. Gairdner for this interesting and very distinct species of fresh-water Bull-head, which is common in the Columbia River. It resembles *gobio* in its general form, but is distinguished from it, at first sight, by the roughness of the skin, exclusive of other characters. It is a larger fish.

### DESCRIPTION

Of a male specimen.

FORM.—Head not so much depressed as in *gobio*, its height being proportionably greater and its breadth less; it forms a third part of the length of the fish, excluding the caudal. The top of the head is flat, or rather widely concave, the margins of the orbits being smoothly and roundly elevated; there are no other indications of lateral ridges, nor any tubercles or spines on the top of the skull. On close examination a small spinous point may be detected on the nasal bones; the operculum ends in a thin flat point, which is masked by a narrow, flexible, cartilaginous process of the suboperculum, imbedded in membrane, and forming the tip of the gill-cover; the suboperculum ends anteriorly in an acute point, but its edge is even: the spine at the angle of the preoperculum is more evident, and when divested of the skin which envelops it, shows a very acute, clear point, curved slightly upwards; the under edge of the preoperculum forms two distinct angular points: the scapular bone ends in an acute point, which can scarcely be felt through the skin, but none of the bones margining the gill-openings, nor any of the opercular pieces, are serrated. In the recent specimen the spines are perceptible only to the touch, being concealed from the eye by the integuments. The posterior tips of the intermaxillary pedicles may be mistaken for spines. The under lip projects a little beyond the upper one when the mouth is closed. The eyes are more than one of their diameters apart. The SKIN of the head is quite smooth to the touch, but it is dotted, particularly on the crown, with minute soft warts. The belly, a stripe adjoining the anal on each side, a small space round the base of the caudal, and the interscapular space anterior to the first dorsal, are also smooth; but the rest of the skin of the body is thickly studded with very small, subulate, acute spines

directed backwards. These spines are too minute to be seen distinctly by the naked eye, but a little fold of skin, raised by each of them, produces a roughness which is very visible; they resist the finger only when it is drawn against their points. The *lateral line*, formed by a furrow, interrupted by about forty-four contractions, is very conspicuous.

FINS.—*Br.* 6—6; *P.* 16; *V.* 1/4; *D.* 9/—21; *A.* 18; *C.* 9½.

The *ventrals* are situated posterior to the three under rays of the pectorals and anterior to the upper ones. The *pectorals* are obliquely obovate. The *first dorsal*, commencing opposite the upper pectoral ray and supra-scapular point, is lower than the second one and not half its length; its spines are slender, but scarcely flexible, and its membrane is attached to the lower third of the first ray of the second dorsal; the sixth and seventh spines are the longest. The *second dorsal* commences opposite the anus, and extends a little farther back than the anal.

“COLOURS, generally, greyish-white; top of the head, back, and sides studded with small clove-brown spots, in some places confluent and forming patches. Pectorals, dorsals, and caudal marked with transverse rows of clove-brown spots. Under parts whitish with minute specks.” (Gairdner.)

INTESTINES.—The stomach is a roundish muscular bag, having one-third of its cavity beneath the pylorus. There are five cæca, four of them slender, cylindrical, and of unequal lengths, the fifth a short oval bag.

## DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from tip of snout to extremity of caudal . . . . .	9	6	Height of body at the pectorals . . . . .	2	5
"    "    base of caudal . . . . .	8	3	Length of pectorals . . . . .	2	9½
"    "    end of second dorsal . . . . .	7	4	"    ventrals . . . . .	1	6
"    "    end of anal . . . . .	7	2	"    first dorsal . . . . .	1	6½
"    "    beginning of ditto . . . . .	4	6	Height of ditto . . . . .	0	7
"    "    beginning of second dorsal . . . . .	4	2	Length of second dorsal . . . . .	3	3½
"    "    anus . . . . .	4	2	Height of ditto . . . . .	1	0
"    "    beginning of first dorsal . . . . .	2	7	Length of anal . . . . .	2	8½
"    "    upper ray of pectorals . . . . .	2	8½	Height of ditto . . . . .	1	0
"    "    tip of gill-cover . . . . .	2	8	Length of caudal (centre) . . . . .	1	3½
"    "    first ray of ventrals . . . . .	2	3	Spread of caudal . . . . .	1	5
"    "    angle or spine of preoperculum . . . . .	2	2	"    pectorals . . . . .	1	9
"    "    nape . . . . .	2	1	Circumference of head . . . . .	5	6
"    "    posterior edge of orbit . . . . .	1	3	"    body between dorsals . . . . .	4	0
"    "    end of labial . . . . .	1	3	Height at same place . . . . .	1	4
"    "    anterior edge of orbit . . . . .	0	9	"    of tail behind second dorsal . . . . .	0	6
"    "    tips of intermaxillary pedicles . . . . .	0	6½	Length from gullet to bottom of stomach . . . . .	1	9
"    of labials . . . . .	1	3	"    pylorus . . . . .	1	3
"    lower jaw . . . . .	1	4	"    pylorus to anus . . . . .	6	6
Breadth between orbits . . . . .	0	7½	"    of whole alimentary canal . . . . .	7	9
"    "    tip of preopercular spines . . . . .	1	9	"    longest cæcum . . . . .	1	5
"    "    pectorals . . . . .	1	6	"    shortest ditto . . . . .	0	5

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[15.] 5. COTTUS GRÆNLANDICUS. (Cuvier.) *Greenland Bull-head.*

I am obliged to Mr. Audubon for three specimens of a *cottus* taken at Newfoundland, which are almost without a doubt examples of the species described by Fabricius under the appellation of *scorpius*, called *Grænladicus* by Cuvier, and known to the Greenlanders by the names of *kaneek* and *kaneoonak*. They have the four tubercles bounding a square area on the top of the head, and the sixteen spines enumerated by Fabricius; viz., a nasal, opercular, subopercular, scapular, and humeral one, with three preopercular ones on each side; the colours of the body also, and rays of the fins, agree sufficiently well with the description in the *Fauna Grænladica*. As Captain J. C. Ross informs us that the *cottus quadricornis* of the appendices to Sir Edward Parry's first and third voyages, and of Sir John Ross's recent one, is named *kan-ny-yoke* by the Esquimaux of Boothia, it is rendered probable that it also ought to be referred to *Grænladicus*. The *scorpioides* of Fabricius, quoted by the authors of these appendices as synonymous with their *quadricornis*\*, is named *pokudlek* and *eegarsok* by the natives, and differs from the true *quadricornis* of Linnæus and Bloch by many characters; it wants the nasal, scapular, and humeral spines which exist in *Grænladicus*. Dr. Mitchell gives so slight a notice of his *cottus scorpius* (the *cottus Mitchilli* of Cuvier), that it is impossible to come to any certain conclusion respecting it, but the little that he does say of its colours, and the comparative length of its spines, applies also to *Grænladicus*. *Cottus octodecim-spinosus* may be readily distinguished from *Grænladicus* by the length of its preopercular spine, which in the latter falls more than its own length (or nearly three-quarters of an inch in our largest specimen) short of the tip of the opercular spine. The two species differ likewise remarkably in the size of the pyloric cæca, and in other respects. Their tints of colour are, however, at times much alike, for the markings in Mr. Audubon's specimens are very similar to those exhibited by specimens of *octodecim-spinosus*, brought from Newfoundland by M. Pilaye. (*Hist. des Poiss.*, viii., p. 459.)

Cuvier remarks that the account of the *kaneek* and other Greenland species given by Fabricius, forms the ground-work of almost all that has been said by

\* In page 45 I hazarded a conjecture that this fish might be identical with my *hexacornis*, under the supposition that the two anterior horns might have been overlooked, but the acquisition of the Newfoundland specimens having dispelled the obscurity which hung over the *scorpius* of Fabricius, has rendered a reference of the *quadricornis* of the recent Arctic Voyages to the *Grænladicus* more likely to be correct.

naturalists of the sea-scorpion and father-lasher (*scorpius* and *bubalis*) of European seas. The *kaneek* is described as a most voracious fish, and this character is fully maintained by the individuals from Newfoundland, whose stomachs contained the vertebral columns of several small fish, some entire crabs, the peelings of potatoes, and other substances.

## DESCRIPTION.

FORM.—*Head* large, forming more than a third of the length of the fish, caudal included; its height at the nape is about a fourth of the length, exclusive of the caudal, and its breadth there, when the gill-covers are closely shut, scarcely exceeds its height. Eyes lateral with a slight inclination upwards, and placed their own diameter apart. The upper border of the orbit is much elevated and terminates posteriorly in a rounded, obtuse, somewhat uneven knob, about the size of a grain of duck-shot. At the foot of this, and so covered by skin as not always to appear distinct, there is a smaller tubercle which forms the commencement of a low even ridge, that separates the temples from the crown of the head, and terminates on the nape by a tubercle similar to the orbital one. The space bounded by the orbital and nuchal tubercles of each side is flat, and in the female nearly square, but in the males it is narrower, the posterior tubercles being nearer to each other than the anterior ones. The space between the orbits is much depressed and is bounded anteriorly by the nasal spines and the prominent ends of the intermaxillary pedicles which play between them. In *cottus octodecim-spinosus* the place of the four tubercles on the top of the head is occupied by compressed, curved spines. There are velvet-like plates of *teeth* as usual on the intermaxillaries, lower jaw, and vomer, but none on the palate bones in *Grœnlandicus*.

SPINES.—None of the spines project distinctly through the skin in the ordinary state of the fish, though all are subulate and acute. The *nasal* ones are small. The principal one at the angle of the *preoperculum* is stout, straight, awl-shaped, and only about one-sixth of the total length of the head, or rather shorter than the diameter of the orbit; it is inclined a little upwards; an equally stout spine, only half as long, springs from its base beneath and inclines slightly downwards; while the lower limb of the *preoperculum* ends just behind the articulation of the lower jaw in a spinous point directed forwards—the number of *preopercular* spines being the same as in *cottus scorpius*. The anterior under spinous angle of the *suboperculum* points downwards, but there are no serratures nor spines on the edge of this bone, which is continued backwards by a thin, strap-shaped, flexible, cartilaginous process forming, with the integuments in which it is imbedded, a triangular, but not very acute tip to the gill-cover. The *opercular* spine is much concealed by the skin, and falls nearly half an inch short of this tip. The *scapular* spine, though shorter than the opercular one, to which it is parallel, is fully as stout. The tip of the short *humeral* spine coincides exactly with the tip of the gill-cover. There are no serratures on any of the spines, or bones of the head or shoulder, in which respect this species differs from *bubalis*; while by there being only two, and not three, strong spines at the angle of the *preoperculum*, it is distinguished from the *quadricornis* of Linnæus and my *hexacornis*.

FINS.—*Br.* 6—6; *P.* 17; *V.* 1/3; *D.* 10/—17; *A.* 13; *C.* 11½. In two specimens.  
6—6; 17; 1/3; 10/—18; 12; 11½. In one ditto.

The *pectorals* are large and wide, reaching backwards to the anus and second dorsal. The *first dorsal*, commencing opposite to the tip of the gill-cover, is high anteriorly and rounds off gradually posteriorly, its membrane terminating exactly at the base of the second dorsal. The spinous ray of the *ventral* is short and not easily distinguishable from the first soft ray to which it is applied.

**SKIN.**—The top of the head is sprinkled with little soft conical pimples, and on the body and posterior surfaces of the pectoral rays there are a number of small circular scales, whose surfaces, and particularly their posterior margins, are studded with very short minute spines. The general tint of the upper parts of the fish is dark-brown, which is mixed on the top of the head with large clay-coloured patches, and on the gill-covers, nape, and pectorals, with crimson-red blotches; there are also some smaller spots of the latter on the back. The sides, belly, and pectoral and ventral fins are ornamented by perfectly circular spots as big as the point of the finger, of dead-white, generally bounded by a ring darker than the neighbouring skin. Some of the white spots on the pectorals are placed excentrically on a larger orange-coloured mark, and there is a row of large orange spots on the under surface of the tail. The dorsal fins are blackish with oblique dull, yellowish, irregular spots or bars. On the anal the yellowish bars alternate more distinctly with the purplish-black ones, there being three of each; and on the caudal there are three transverse rows of contiguous, large, black spots on a yellowish ground, with indications of a fourth row on the tips of the rays. The colours of the female specimen are much less brilliant.

**INTESTINES.**—The stomach is a bag with folds towards its fundus, and minute reticulated wrinkles round the pylorus, where its parietes are thickened. The linings of the œsophagus and stomach have a very different appearance, and are separated by a distinct line. There are seven long cylindrical pyloric cæca. The liver is very large, and after long immersion in spirits retains a bright scarlet colour.

DIMENSIONS

Of a female specimen.

	Inches.	Lines.		Inches.	Lines.
Length from tip of upper lip to end of caudal	13	6	Distance between upper orbital tubercles	0	9
"    "    base of central rays of ditto	11	4	"    "    nuchal tubercles	0	8½
"    "    end of second dorsal	10	3	"    "    nuchal and orbital tubercles	0	10
"    "    end of anal	10	2	Length of preopercular spine	0	9½
"    "    beginning of ditto	8	3	"    pectorals	3	0
"    "    anus	6	11	Spread of ditto	4	4
"    "    beginning of second dorsal	6	8	Length of ventrals	2	2
"    "    beginning of first dorsal	4	5	"    attachment of first dorsal	2	9
"    "    tip of gill-cover	4	7½	Height of first dorsal	1	8
"    "    tip of opercular spine	4	2	"    second dorsal	2	0
"    "    tip of preopercular spine	3	9½	Length of its attachment	3	4
"    "    nape	3	5	"    attachment of anal	2	4
"    "    tip of labial	2	3½	Height of anal	1	6
"    "    posterior edge of orbit	2	0	Length of caudal	2	2
"    "    anterior edge of ditto	1	2½	Spread of ditto	3	0
"    "    of axis of orbit	0	10½	Greatest circumference of body	8	6
"    "    vertical diameter of ditto	0	7½	Length of longest pyloric cæcum	1	8
Distance between upper margins of orbits	0	9½	shortest ditto	1	0

Page 52, before *Sebastes Norvegica*.

[127.] 1. SCORPÆNA BUFO. (Cuvier.) *Sea Toad*.

*La scorpène crapaud de mer (Scorpæna bufo)*. CUV. et VAL., iv., p. 306.

Mr. Audubon brought a specimen from Newfoundland of this fish, which is an inhabitant of the Caribbean Sea and coast of Brazil, and will, no doubt, be hereafter detected in the intervening sea of the United States. I have received no account of its habits, nor is anything said on that subject in the *Histoire des Poissons*.

Cuvier observes that the most obvious distinctive mark of the sea-toad consists in the axilla of its black pectoral being dotted with round milk-white spots, a character which is not destroyed by immersion in spirits, and is very conspicuous in our specimen, though it is injured elsewhere. The barbels, and the soft integuments of the head in particular, are decayed, so that the spines and ridges of the cranium are much exposed, and a greater number may be reckoned than Cuvier enumerates in his description of *scorpæna scrofa*, but the principal ones occupy the same situations as in that species, though they are more prominent and robust. The nasal spines are not denticulated, which is the only circumstance in which the Newfoundland fish does not correspond with the description of *bufo* in the *Histoire des Poissons*. Thirty-two or thirty-three spines may be reckoned on each side of the head and shoulder, viz., one on the nasal bone; five on the elevated bony margin of the upper half of the orbit, the lowest one before and behind being the sharp terminations of the bone; three in a row extending backwards from the orbital ridge to the nape, occupying the position of the cranial ridges in the *cotti*, and flanking a deep circular depression on the top of the skull; five in a row parallel to the above, commencing close to the orbit, passing over the temples and ending on the shoulder; the posterior part of this row is doubled, adding two spines more; four divergent ones on the anterior sub-orbital; three on the ridge of the second sub-orbital which traverses the cheek obliquely; six on the preoperculum, as in *scorpæna porcus*, the principal one being at the angle, and the two next in size standing at equal distances a little way below it; two on the operculum, tipping its divergent, obtuse keels which are slightly furrowed longitudinally; the acute points of the suboperculum and interoperculum, pointing downwards and in contact with each other, are not spinous; the thirty-second spine tips the humeral bone immediately above the pectoral, and the edge of the bone is widely notched above the spine, so that the upper corner of the notch, which is acute and prominent, may be taken for another spine. The bands of *teeth* on the jaws, vomer, and palate-bones are narrow. The upper and lower pharyngeals are also toothed *en velours*.

FINS.—Br. 7—7; P. 20; D. 12/9; A. 3/5; V. 1/5; C. 14½.

The fifth *dorsal* spine is the tallest, but the third, fourth, sixth, and seventh are scarcely perceptibly shorter, the eleventh is as high as the second, and the twelfth is taller, being equal to the tenth, but shorter than the third. The *anal* spines are very robust, they are deeply grooved behind, and also furrowed in front, seeming as if they were formed by the consolidation of two or three spines, particularly the second one, which is highest and stoutest, and is enlarged downwards by the thin expansion of one of the edges.

The *scales* are obtusely oval, with crenatures on their basal margin corresponding with from fourteen to twenty furrows that converge towards the exposed edge of the scale, which, with a portion of the adjoining surface, appears rough under the microscope, but is not grooved or toothed. A scale on the anterior part of the body is rather more than a quarter of an inch long, and thirteen of them, when *in situ*, are included within a linear inch. There are forty-seven on the lateral line, and thirty-four in a vertical row where the body is highest. The colours have been mostly destroyed by the spirit in which the specimen is kept, but, exclusive of the spots on the pectoral already noticed, various large marks on the flanks are discernible, and there are traces of a large spot on the tips of the soft rays of the dorsal.

## DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from tip of upper lip to end of caudal	7	0	Length from tip of upper lip to begin. of dorsal	2	1
" " beginning of ditto . . . . .	5	7	" " nape . . . . .	1	6½
" " end of dorsal . . . . .	4	11	" " centre of orbit . . . . .	0	9
" " end of anal . . . . .	4	9½	Diameter of orbit . . . . .	0	6
" " beginning of ditto . . . . .	4	0	Length of intermaxillary . . . . .	0	9
" " anus . . . . .	3	7	" labial . . . . .	1	1
" " tip of humeral spine . . . . .	2	4	Breadth of lower end of ditto . . . . .	0	4
" " gill-cover . . . . .	2	3½	Length of fourth dorsal spine . . . . .	0	9
" " tip of opercular spine . . . . .	2	2	" second anal spine . . . . .	1	2

Page 111, after *Abramis Smithii*.

[128.] 2. CYPRINUS (ABRAMIS) BALTEATUS. (Rich.) *Red-sided Bream*.

This pretty little bream, which is an inhabitant of the Columbia, was sent to me by Dr. Gairdner.

## DESCRIPTION.

COLOUR.—“ Back of head and body mountain-green, with iridescent tints of yellow and blue. Belly silvery-white.—A bright gold-yellow band behind the eye on the margin of the preoperculum, and a broad scarlet-red stripe beneath the lateral line, extending from the gill-opening to the anal. Fins of an uniform greenish-grey colour without brilliancy.” (Gairdner.)

FORM much compressed, the depth of the body being equal to one-fourth of the distance between the tip of the snout and the caudal fork, while its thickness is only equal to a tenth



of the same distance. The profile curves moderately from the snout to the dorsal, just before which the depth of the body is greatest, but it continues to be considerable at the insertion of the anal, the belly running as it were into an acute edge at that place: the short piece of the tail behind the anal is narrow. The *head*, forming exactly one-fourth of the length of fish, excluding the caudal, has a conical profile when the mouth is shut, the apex being formed by the tip of the lower jaw, which projects a very little beyond the commissure of the mouth. The top of the head is comparatively broad and rounded, its thickness at the nape being equal to that of any part of the body, and the snout, when viewed from above, appearing obtuse. *Eyes* large, much nearer to the snout than to the gill-opening. *Nostrils* near the eyes. *Mouth* toothless, small, its commissure descending obliquely and not reaching farther back than the nostrils: the lower jaw, when depressed, projects considerably beyond the upper one. **GILL-COVERS.**—Bony *operculum* quadrangular, its slightly-convex under edge being equal to the anterior one, and fully one-third longer than the upper or posterior one: the latter is widely emarginated, or cut with a concave curve. The *suboperculum*, one-third of the height of the operculum, is rounded off posteriorly in the segment of a circle, forming an obtuse tip to the gill-cover: both these bones are edged with membrane. *Preoperculum* narrow.

**SCALES** thin and sub-orbicular, their transverse diameter being rather greater than their longitudinal one. A few crenatures may be obscurely seen on their basal edges with a lens, and very faint lines proceeding from them towards the centre. There are about fifty-seven scales on the lateral line, and the greatest diameter of one taken from the anterior part of the sides measures a line and a half. A linear inch includes sixteen or seventeen of them *in situ*. The *lateral line* is curved convexly downwards, just before the ventrals, rising so as to run straight through the tail. It is formed by a short tube on each scale.

**FINS.**—*Br.* 3—3; *P.* 17; *D.* 11; *V.* 9; *A.* 19 to 22; *C.* 19½.

The *ventrals* are attached a little anterior to the middle, between the tip of the snout and base of the caudal, or opposite to the eighth ray of the dorsal; their tips reach to the anal. The anal and dorsal are high anteriorly, and become considerably lower posteriorly, with a slight concave sweep; the articulations of the first ray of each are obsolete.

The *air-bladder* is divided by a contraction into two portions, of which the lower one is the largest. There are forty vertebræ in the spine.

**DIMENSIONS.**

	Inches.	Lines.		Inches.	Lines.
Length from tip of snout to end of caudal lobes	5	9½	Length of lower jaw	0	4½
"    "    end of central caudal rays	5	0	"    pectorals	0	11½
"    "    base of ditto	4	7	"    ventrals	0	8½
"    "    end of anal	4	0	"    attachment of anal	1	1½
"    "    end of dorsal	3	2½	Height of anal anteriorly	0	9
"    "    beginning of anal	2	11	"    posteriorly	0	2½
"    "    anus	2	10½	"    dorsal anteriorly	0	10½
"    "    beginning of dorsal	2	6½	"    posteriorly	0	3½
"    "    ventrals	2	1	Length of attachment of dorsal	0	8
"    "    tip of gill-cover	1	1	"    lobes of caudal	1	3½
"    "    nape	0	9	"    its longest rays	1	2
"    "    posterior edge of orbit	0	6½	"    its central ditto	0	4½
"    "    anterior ditto	0	3½	Depth of caudal fork	0	9½
"    "    nostrils	0	2½	"    body at ventrals	1	3½
"    "    tip of labials	0	3½	Thickness of body where greatest	0	6

Page 115, after *Catostomus Hudsonius*.

[129.] 6. CYPRINUS (CATASTOMUS) RETICULATUS. (Cuvier.)  
*Lattice-scaled Catostomus.*

*Catostomus reticulatus.* CUVIER, *in lit.*

I had referred an imperfect specimen of this fish, obtained in Lake Huron, to *C. Hudsonius*, but after examining several very well-prepared examples from Albany River, I think it probable that it may prove to be a distinct species. If, on a comparison of the recent fish, this question be decided in the negative, Cuvier's specific name must give place to Le Sueur's prior one of *Hudsonius*.

The head is less convex at the eyes, the eyes themselves are farther back, the mouth is a little smaller, and the depth of the body somewhat greater than in *C. Hudsonius*; but the length of the head, which does not form a fifth part of the whole length of the fish, and the other external proportions, are the same as in that species. The scales, however, which are more distinctly radiated and crenated, exhibit in the prepared specimens of the younger individuals a nearly uniform hyacinth-red tint; and in the older ones reddish-orange tips with dark grey bases, forming a coloured mesh-work, whence the specific name. The belly is pale. The scales of the lateral-line vary in number from 70 to 77, and there are 18 or 20 in a vertical row under the dorsal.

FINS.—*Br.* 3; *P.* 17 to 19; *D.* 14 to 15; *V.* 10 to 11; *A.* 8; *C.* 20 $\frac{1}{2}$ .

DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from end of snout to tips of caudal	. 21	0	Height of dorsal	. 2	4
"    "    end of scales of ditto	. 18	0	Length of its attachment	. 3	2 $\frac{1}{2}$
"    "    beginning of anal	. 14	8	"    "    ventrals	. 2	3 $\frac{1}{2}$
"    "    ventrals	. 10	0	Depth of anal	. 3	5
"    "    dorsal	. 8	2	Length of its attachment	. 1	6
"    "    edge of gill-cover	. 3	11	Space between it and caudal	. 1	9
"    "    nape	. 3	3	Depth of body before dorsal	. 3	10
"    "    centre of orbit	. 2	1	Breadth of nape	. 2	1
"    of pectorals	. 3	3			

Page 119. *Catostomus Sueurii*.

By the acquisition of three well-prepared specimens from the Albany River district, Hudson's Bay, I am enabled to give the dimensions of this fish more fully.

		DIMENSIONS.			
		Inches.	Lines.	Inches.	Lines.
Length from end of snout to tips of caudal	. 19	6		Breadth of nape	. 1 10
" " end of central rays	. 18	2		Length of pectorals	. 5 0
" " end of scales on ditto	. 16	7		Height of dorsal	. 3 0
" " end of anal	. 14	3		Length of its attachment	. 3 0
" " anus	. 13	0		" ventrals	. 2 4
" " ventrals	. 9	0		Depth of anal	. 3 6
" " dorsal	. 7	2		Length of its attachment	. 1 9
" " edge of gill-cover	. 3	0		Space between anal and caudal	. 1 11
" " nape	. 2	6		Length of caudal lobes	. 4 0
" " centre of orbit	. 1	7		" central rays of caudal	. 1 4
" of axis of orbit	. 0	8½		Depth of caudal fork	. 1 9

Page 122, to follow *Cyprinus (Leuciscus) chrysoleucas*.

[130.] 3. CYPRINUS (LEUCISCUS) CAURINUS. (Rich.) *North-west Dace*.

FAMILY, Cyprinoidæ. GENUS, Cyprinus. Sub-genus, Leuciscus. CUV.

This *dace* inhabits the Columbia River, and is abundant at Fort Vancouver, from whence I have obtained two dried specimens through Dr. Scouler, and more recently two preserved in spirits from Dr. Gairdner. The latter gentleman makes no mention of it in his notes, and does not seem to have distinguished it from the following species, of which examples were inclosed in the same vessel; hence the tints of colour in both, when fresh, may be supposed to be nearly the same. It is very different from *leuciscus gracilis* in the size of its head, the form and size of its scales, and other characters, being much more closely allied to the Common European dace, from which, however, it may be readily distinguished by the following characters.

DESCRIPTION.

FORM handsome, moderately compressed, circumference of the body greatest just before the dorsal, where the height is equal to one-fifth of the distance between the tip of the snout and end of the central caudal rays: the thickness there rather exceeds half the height. The shoulders are thick and arched in profile. The *head* forms one-fourth of the length of the fish, caudal excluded: the snout is rather obtuse, and projects a little beyond the shut mouth; the orbit is nearly two of its diameters from the tip of the snout, and almost three diameters from the most posterior part of the gill-flap. The under jaw shuts within the upper one, and its tip is then more than the thickness of the upper lip, or above two lines posterior to the end of the snout. *Gill-cover* rather broadly edged with membrane, rounded at the apex; posterior edge of operculum straight.

SCALES sub-orbicular, crenated exteriorly, and impressed with from fourteen to twenty fine but conspicuous lines, radiating from near the base, which is neither furrowed nor crenated. There are seventy-five on the lateral line, twenty-four in a vertical line before the dorsal, and ten in a linear inch measured on the forepart of the sides.

FINS.—*Br.* 3—3; *P.* 18; *D.* 10; *V.* 10; *A.* 9; *C.* 19½.

The *dorsal* commences exactly midway between the tip of the snout and base of the central caudal rays: its first ray is so short as to be scarcely perceptible through the skin, and with the second one is closely applied to the base of the third: the latter and the fourth are the longest. The *ventrals* are attached under the fifth dorsal ray, or considerably before the middle of the fin, and midway between the gill-opening and end of the *anal*, which is similar in shape to the dorsal, being highest anteriorly. The *caudal* is deeply forked.

DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from tip of snout to extremity of caudal . . . . .	12	6	Length of under jaw to articulation . . . . .	0	9
" " end of central caudal rays . . . . .	11	2	" vertical gape of mouth . . . . .	0	9½
" " base of ditto . . . . .	10	6	" transverse ditto . . . . .	0	8½
" " end of anal . . . . .	8	5	" pectorals . . . . .	2	2
" " beginning of ditto . . . . .	7	6	" ventrals . . . . .	1	4½
" " anus . . . . .	7	5	Height of dorsal anteriorly . . . . .	1	8½
" " end of dorsal . . . . .	6	5	" ditto posteriorly . . . . .	0	9
" " ventrals . . . . .	5	7	Length of attachment of dorsal . . . . .	1	2
" " beginning of dorsal . . . . .	5	4	" " anal . . . . .	1	0
" " pectorals . . . . .	2	9	Height of anal anteriorly . . . . .	1	5
" " tip of gill-cover . . . . .	2	8½	" ditto posteriorly . . . . .	0	7
" " tip of bony operculum . . . . .	2	7½	Length of caudal lobes . . . . .	2	3
" " nape . . . . .	2	2½	" its middle rays . . . . .	0	8
" " posterior edge of orbit . . . . .	1	4	Depth of caudal fork . . . . .	1	0
" " anterior ditto . . . . .	0	10½	Height of body before dorsal . . . . .	2	3
" " anterior nostril . . . . .	0	6½	Greatest thickness . . . . .	1	3
" " tip of labial . . . . .	0	9	" circumference . . . . .	6	0
" of margin of upper jaw, one side . . . . .	0	8	Thickness at nostrils . . . . .	0	9
" ditto under jaw . . . . .	0	6½	" between orbits . . . . .	0	10
			" of nape . . . . .	1	3

[131.] 4. CYPRINUS (LEUCISCUS) OREGONENSIS. (Richardson.)  
*Columbia River Dace.*

This species is also an inhabitant of the Oregon, or Columbia River, and is so similar in general appearance to the last, that it may be readily confounded with it, though it is certainly specifically distinct, as may be seen by the following differences.

FORM more tapering forwards, the shoulders not being so high: *head* longer, forming one-fourth part of the length of the fish, including the middle caudal rays: *snout* obtuse and even

with the margins of the upper and lower jaw when the mouth is closed: mouth considerably larger, being cleft as far back as the edge of the orbit: anterior sub-orbital more oblong and perforated by a greater number of foramina: the gill-cover less widely rounded, and the edge of the operculum concave, though not so much so as in *leuciscus gracilis*, pl. 78. The dorsal also stands farther back, being nearer to the tip of the tail than to the point of the snout, while the ventrals stand under the first dorsal ray, and midway between the orbit and base of the central caudal rays. The distance from the gill-openings to the ventrals reaches from the latter to half way between the anal and caudal. The size of the scales, generally, and their number on the lateral line, is the same as in *leuciscus caurinus*, but their form is more perfectly orbicular, and those on the belly are proportionably smaller.

FINS.—Br. 3—3; P. 15; D. 10; V. 9; A. 9; C. 19½.

“COLOUR of the back and top of the head intermediate between yellowish grey and brocoli-brown, passing gradually on the sides, below the lateral line, into sulphur-yellow, the latter colour prevailing also on the cheeks, gill-covers, and bases of the fins. The belly is silvery white.” (Dr. Gairdner.)

## DIMENSIONS.

	Inches.	Lines.		Inches.	Lines.
Length from tip of snout to extremity of caudal . . . . .	13	0	Height of gape of mouth . . . . .	1	0
"    "    end of central caudal rays . . . . .	11	11	Length of ditto transversely . . . . .	0	10½
"    "    base of ditto . . . . .	10	10	"    pectorals . . . . .	1	8½
"    "    end of anal . . . . .	8	7½	"    ventrals . . . . .	1	6
"    "    beginning of ditto . . . . .	7	8½	Height of dorsal anteriorly . . . . .	1	8
"    "    anus . . . . .	7	7	"    ditto posteriorly . . . . .	0	9
"    "    end of dorsal . . . . .	7	2	Length of attachment of dorsal . . . . .	1	2
"    "    ventrals . . . . .	6	1	"    "    anal . . . . .	0	11
"    "    beginning of dorsal . . . . .	6	1	Height of anal anteriorly . . . . .	1	6
"    "    pectorals . . . . .	3	2	"    ditto posteriorly . . . . .	0	8½
"    "    tip of gill-cover . . . . .	3	1	Length of caudal lobes . . . . .	2	4½
"    "    tip of bony operculum . . . . .	2	11	"    its middle rays . . . . .	1	1½
"    "    nape . . . . .	2	4	Depth of caudal fork . . . . .	1	0
"    "    posterior edge of orbit . . . . .	1	5	Height of body before dorsal . . . . .	2	3
"    "    anterior ditto . . . . .	0	11	Greatest thickness . . . . .	1	2½
"    "    anterior nostril . . . . .	0	7	"    circumference . . . . .	5	3
"    "    tip of labial . . . . .	1	2½	Thickness at nostrils . . . . .	0	9½
"    of margin of upper jaw one side . . . . .	1	2½	"    between orbits . . . . .	0	10½
"    ditto under jaw . . . . .	0	10	"    of nape . . . . .	1	3
"    under jaw to articulation . . . . .	1	4½	Weight 9 oz. 2 dr.		

Mr. Yarrell, in the tenth number of his History of British Fishes, which has just reached me, states this fish to be the same with the *Salmo eriox* of Linnæus, *Salmo griseus seu cinereus* of Ray and Willughby, and the Whiting and Bull

trout of the Tweed. Its young are named Warkworth and Coquet trout, in the north of England, and it is also supposed to be the species which the Scottish fishermen call Norway trout and Norway salmon. I have recently ascertained that the note at the bottom of page 140 respecting the habits of the Salmon-trout refers properly to the *salmo Cambriscus*, which is termed salmon-trout in many parts of Cornwall and Wales, while the appellation of Sewin is given indiscriminately to our Salmon-trout (p. 140), and to the *salmo trutta*, or Nith trout (p. 142). Colonel Lawrence informs me that the hook of the under jaw is very decided, even in the young *salmo Cambriscus*. This fact, together with a consideration of the synonyms quoted by Mr. Yarrell, tends to strengthen the opinion I have expressed of the Lapland salmon noticed by Linnæus, the *S. hamatus* of Cuvier, the Bull trout of the Tweed, and the *S. Cambriscus* of Donovan, being one and the same species. According to Mr. Yarrell the normal number of the dorsal vertebræ in the Bull-trout is 59.

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Page 144. *Salmo fario*.

In Mr. Yarrell's work, part x., p. 53, the normal number of the dorsal vertebræ in this species is stated to be 56, instead of 58 as I have mentioned in the text.

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Page 226, to follow *Salmo Clarkii*.

By the friendly attentions of P. W. Dease, Esq., I have received small specimens of three different kinds of trout from New Caledonia. One species, named by the natives\* DUGGANG, agrees exactly in external characters with the *Salmo nitidus* of the peninsula of Boothia (page 171, pl. 82, f. 1), the only discrepancy being some traces of a different distribution of spots and tints of colour, which may be owing to the different seasons in which the fish were captured, or to the mode of preparing the skins.

Another, named SUPPAI, of which there are three specimens, resembles the young of an anadromous salmon. The scales are thin, flexible, and bright, the body is marked chiefly above the lateral line with scattered crucial or crescentic black spots, and the dorsal and caudal are thickly dotted with oval blackish marks

\* The envelopes of the specimens on which the names were written having been disturbed at the Custom-house, the appropriation of the native names is not quite certain.

in rows\*. The fins generally, but the under ones especially, are small, and the latter appear to have been of a pale hue. In form and proportion of parts, as well as in dentition, this fish strongly resembles the *Hirling*, noticed in p. 141, and might easily be confounded with the *Salmon trout*, p. 140, pl. 92, f. 1; though on examination some slight differences in the forms of the opercular pieces may be detected. The characters ascribed by Dr. Gairdner to the *Tsuppitch* of the Columbia (p. 224) agreeing well with this fish, and the names being so similar, we may conclude that they are the same, and also that they belong to the species named *Silvery-white Salmon trout*, by Lewis and Clarke. (*Vide* F. B. A., iii. p. 163.)

The *ULTAI* of the New Caledonia tribes differs from the last in the scales being firmer, duller, and rather smaller, and the body more thickly and generally covered with black spots, which extend well down the sides. The spots on the dorsal and tail are also more regular and conspicuous, and the teeth are stronger, especially those on the palate bones; a flexuose row on the vomer does not extend quite so far back as the palatine teeth. The *Ultai* is most probably the *Salmo Clarkii*, p. 225, and also the *Dark salmon trout* of Lewis and Clarke, noticed in p. 163.

It is interesting to receive two fish so like European species as the *Suppai* and *Ultai* from rivers falling into the Northern Pacific. They are very closely allied indeed, by external form, to the *Salmon trout*, No. 2, p. 140, *Hirling*, No. 3, p. 141, and *Nith trout*, No. 5, p. 142, which are considered by many Ichthyologists to be only varieties of *salmo trutta*, produced by local causes.

## DIMENSIONS.

	<i>Suppai.</i>		<i>Ultai.</i>	
	In.	Lin.	In.	Lin.
Length from tip of snout to extremity of caudal . . . . .	10	10	11	0
"          "          end of its central rays . . . . .	9	11	10	1
"          "          end of scales on ditto . . . . .	9	2	9	4
"          "          end of anal . . . . .	7	6	7	8
"          "          end of adipose . . . . .	7	6	7	9½
"          "          beginning of anal . . . . .	6	8¾	6	11½
"          "          end of dorsal . . . . .	5	6	5	9
"          "          beginning of ditto . . . . .	4	6¾	4	7
"          "          ventrals . . . . .	4	10	5	0
"          "          end of gill-cover . . . . .	2	1	2	1¾
"          "          nape . . . . .	1	4	1	4½
"          "          tip of labials . . . . .	1	0	1	1½
"          "          centre of orbit . . . . .	0	8¾	0	8¾
" of labials . . . . .	0	9¾	0	10½
" under jaw . . . . .	1	2	1	2¾
" pectorals . . . . .	1	3¾	1	6½
" ventrals . . . . .	1	1	1	2½
Height of dorsal . . . . .	1	1	1	3

\* In one specimen the spots on the fins are almost obsolete.

## Page 183. SALMO MACKENZII.

Having received several heads of this fish through the kind attentions of Mr. King, who accompanied Captain Back on his recent expedition, I have been enabled to give a view of the teeth in plate 94, f. 1.

All the teeth are *en velours*, the band on the intermaxillaries and end of the lower jaw is very narrow, that on each palate bone is broader and unites before with a pretty large circular patch on the anterior extremity of the vomer. The greater part of the surface of the tongue is covered with teeth, though its tip is smooth. The labials and sides of the lower jaw are perfectly toothless. The posterior piece of the labial is widest above, tapering gradually to an acute point, which is even with the extremity of the anterior piece, and its length is about two-thirds of that of the latter. The under jaw is shorter than the upper surface of the head. The rays of the gill-membrane vary from nine to ten on the right side, and from ten to eleven on the left, there being generally, though not always, one more of the latter.

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 Page 201. SALMO (COREGONUS) TULLIBEE.

The acquisition of a specimen of the Tullibee from Albany District, Hudson's Bay, enables me to make some essential additions to the description of that fish.

In external appearance, and especially in the size and lustre of the scales, the Tullibee corresponds with the group of Coregoni, named *Salmon-herrings*, and bears the strongest resemblance to *C. lucidus*, p. 207, pl. 90, f. 1. The depth of the body is, however, greater than in that species, and the scales are so tiled, that the uncovered portion measures considerably more vertically than longitudinally. The posterior piece of the labial is likewise wider, and the suboperculum has a fuller, though rounded exterior edge, giving the gill-plate more the form of that of *C. albus*, pl. 89, f. 2. The greatest depth of the considerably-compressed body is equal to one-fourth of the total length, caudal included; while the head forms a fifth part of that length. The under jaw protrudes rather more beyond the upper one than in *C. lucidus*. The lateral line contains eighty-one scales, whose tubular ridges are curved downwards more conspicuously than in other species. There are twenty-three scales in a vertical row under the first ray of the dorsal, a linear inch measured in that direction containing four scales *in situ*, or rather more than seven in a longitudinal direction. The first ray of the ventrals and fifth of the dorsal is opposite to the thirty-first scale of the lateral line, which is exactly midway between the tip of the snout and end of the scales on the caudal.

FINS.—*Br.* 8—9; *P.* 16; *D.* 15—0; *V.* 12; *A.* 14 or 15; *C.* 19½.



		DIMENSIONS.			
		Inches.	Lines.		
Length from tip of snout to tips of caudal	. 15	0	Length of labials . . . . .	0	10½
" " end of central rays of ditto	. 13	7	" lower jaw . . . . .	1	4½
" " end of scales on ditto . . . . .	. 12	7	Height of dorsal fin . . . . .	2	3
" " end of adipose fin . . . . .	. 10	10	Length of its attachment . . . . .	1	8½
" " end of anal . . . . .	. 11	1	" pectorals . . . . .	2	3
" " anus . . . . .	. 10	0	" ventrals . . . . .	2	2
" " ventrals . . . . .	. 6	10	Depth of anal . . . . .	1	5
" " dorsal . . . . .	. 6	3	Length of its attachment . . . . .	1	3
" " edge of gill-plate . . . . .	. 3	0	" lobes of caudal . . . . .	3	0
" " nape . . . . .	. 1	11	" its central rays . . . . .	1	0
" " centre of orbit . . . . .	. 1	0	Depth of caudal fork . . . . .	1	5
" of intermaxillaries vertically . . . . .	. 0	2	" body at dorsal . . . . .	3	10

Obs. Though the species of Coregoni described in this work may be readily distinguished when compared either in a recent or prepared state with each other, yet there may be a difficulty in recognising any single species merely from the descriptions, as the form, colours, and peculiar appearances of the scales are apt to change in spirits, or when dried, and distinctions depending on magnitude are strictly comparative; it may therefore be useful to recapitulate some of the characteristic marks which are less likely to vary. In *C. albus* and *Labradoricus* the lower jaw is equal to the upper one; in *C. tullibee*, *lucidus*, and *harengus*, it is longer; and in *C. quadrilateralis* it is shorter. In *C. albus* the labials are equal in length to the long axis of the orbit (the eye being removed), and their posterior piece has a broad pyriform shape with the obtuse end down. In *C. Labradoricus* the labials have a similar form, but they are decidedly smaller, being shorter than the axis of the orbit. In this species also the suboperculum is more cut away posteriorly, and the head is proportionally smaller in all its dimensions. In *C. tullibee*, *lucidus*, and *harengus* of the *herring-salmon group*, the labials have a more oblong shape, being as wide close to their articulation as at their lower end; and the intermaxillaries are very narrow vertically, so that the edge of the upper lip is but a very little way beyond or beneath the tip of the snout, according as the mouth is shut or open. The depth of body of the tullibee is greater than in the other two species, and its gill-plate, as mentioned above, has a different form. *C. lucidus* and *harengus* can scarcely be distinguished from each other except in a recent state. *C. quadrilateralis* may be known by its very small mouth, small labials, short under jaw, and its peculiar shape of body, which, though flat on the sides, is

less compressed than any of the other North American Coregoni that we have seen.

In Plate 94, f. 2, the head of a *Coregonus albus* is represented the size of life, to show the correct forms of its different parts: in f. 2, b, the mouth is seen in front, and in c, on the stretch sideways, exhibiting the depth of the intermaxillaries, which is much greater than in the herring-salmons, of which reduced figures are given in plate 90.

Page 232. *Hiodon chrysopsis*. PLATE 94, f. 3. Three views of the head, full size.

The dental surface of the *vomer* widens gradually towards the gullet, and the *palate bones* have, in addition to the row of conical teeth on their edges, a small oval plate of minute teeth near their middles.

Page 285, to follow *Acipenser rubicundus*.

[132.] 2. *ACIPENSER RUPERTIANUS*. (Richardson.) *Rupert Land Sturgeon*.

*Acipenser ruthenus major*. FORSTER, *Phil. Trans.*, lxxiii, p. 149. An. 1773.

PLATE 97, f. 1, one-third natural size. Shields full size: a. dorsal: b. lateral: c. ventral.

Two specimens of this sturgeon have reached me from Albany River District. It is a species quite distinct from the *A. transmontanus* (p. 278, pl. 97, f. 2), but is probably the same with the sturgeon which abounds in the Saskatchewan, and has been noticed in p. 279. It ranks decidedly among the *Sterletæ* of Brandt, approaching *A. Ruthenus* closely in its general character.

DESCRIPTION.

FORM more slender and the dorsal profile less elevated anteriorly than in *A. transmontanus*; the top of the head and snout are also more nearly in the same line than in that species, there being no sudden convexity anterior to the orbits. The *snout* is slender and tapers gradually to its extremity, which though narrow is not acute: its breadth at the nostrils equals half the length from thence to its tip, and its sides, instead of sloping off into a thin edge as in the Columbia River sturgeon, are flattened and have a vertical height equal to half the transverse breadth. The upper surface of the snout is finely granulated and

radiated like the top of the head, but its under surface is quite smooth, without any plates on the end of the subrostral bone or cartilage, which is slender and little prominent even in the dried specimen. There are four *barbels* situated rather nearer to the orbits or mouth than to the tip of the snout. They are quite simple, tapering and smooth, except that their inner surfaces are studded with papillæ like beads, in a crowded double series. The anterior margin of the orbit is exactly midway between the tip of the snout and first dorsal shield. The shape of the operculum is somewhat different from that of *A. transmontanus*, and its surface, instead of being reticulated, is marked with fine granulated lines radiating from its middle. *Mouth* smaller than that of the Columbia River sturgeon.

**SHIELDS** in general not so much compressed as those of *A. transmontanus*. There are thirteen or fourteen *dorsal* ones, including a spineless one incumbent on the dorsal; the spines of the others resemble those of the sturgeon just mentioned: there are also two flat shields between the dorsal and caudal. The *lateral shields*, thirty-five in number, have less acutely spinous ridges than those of *A. transmontanus*, but with more oblique, longer, and more approximated lozenge-shaped bases. The *abdominal shields*, nine or ten on each side, are smooth or even pitted on the apex, instead of being crowned by an acute spine-tipped ridge: there are two large flat shields between the anus and anal, and two smaller ones fill the space between that fin and the caudal. There are also in one specimen two small shields between the ventrals,—one before the other. Integuments of the tail nearly as in *A. transmontanus*.

**FINS.**—*Br.* 0; *P.* 40; *V.* 30; *D.* 40; *A.* 25; *C.* 28/84. The fins in general, but the vertical ones especially, are smaller than those of *A. transmontanus*.

## DIMENSIONS.

		Inches.	Lines.			Inches.	Lines.
Length from tip of snout to extremity of tail		26	6	Length of rostral barbels		1	3
" " curvature of tail		22	6	" pectorals		3	6
" " end of dorsal		20	1	" ventrals		2	0
" " end of anal		20	2	" attachment of ditto		2	2
" " beginning of ditto		19	1	" attachment of anal		1	1
" " beginning of dorsal		18	2	" its longest rays		2	0
" " anus		17	6	" attachment of dorsal		1	10
" " end of ventrals		17	2	" its longest rays		1	11
" " beginning of ditto		16	0	" attachment of lower lobe of			
" " nape, including first dorsal				caudal		5	8
shield		6	7	" its longest rays		2	9
" " nape, excluding ditto		5	0	" attachment of upper lobe		5	6
" " pectorals		6	0	Breadth of pectorals		2	0
" " posterior edge of gill-opening		6	0	" between nostrils, upper orifices		1	2
" " edge of operculum		5	10	" between eyes		1	8
" " temporal spiracles		4	3	" between anterior sub-orbitals		1	11
" " posterior edge of orbit		3	6½	" between temporal spiracles		1	10
" " anterior ditto		2	11	" between surfaces of scapulars		2	8
" " posterior end of subrostral bone		2	8½	Circumference of body where greatest		8	6
" " angle of posterior sub-orbital		3	8				
" " superior nasal orifice		2	4				

Obs. *Acipenser maculosus* and *A. oxyrhynchus* of Le Sueur, *Am. Phil. Trans.*, An. 1818, differ from *A. Rupertianus* in their abdominal shields being acutely keeled and spinous. *A. maculosus* has a broader snout than the latter. *Acipenser transmontanus* is represented one-third of the natural size in Plate 97, f. 2. The shields full size, a. dorsal, b. lateral, c. ventral.

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Page 291, to follow *Spinax acanthias*.

[133.] 1. SQUALUS (SCYMNUS) GUNNERI. *The Northern Scymnus*.

FAMILY, Selachii. GENUS, Squalus. Sub-genus, Scymnus. COVIER.  
 Squalus Carcharias. FABRICIUS, *Faun. Grænl.*, p. 127.  
 Eekalloorksoak. GREENLANDERS.

This species, which we omitted to quote from Fabricius in its proper place, rivals the White Shark in size, and is greatly dreaded in the Greenland seas. It is reported to have occasionally destroyed the native fisherman by biting off his lower extremities, together with the bottom of the skin-covered kayack in which he was seated.—The *scymni* have spiracles, but are destitute of the anal fin and dorsal spines. The second dorsal is over the ventrals.

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Page 295. COTTUS ASPER.

PLATE 95, f. 1, two-thirds natural size.

I neglected to mention in the description of this species, that it differs from its congeners in having teeth on the palate-bones, being in that respect like *Hemilepidotus*, to which genus it will probably be hereafter referred. It wants the scales however of the latter, and its dermal spines are peculiar. A side view of the fish, a front of the head, and the roof of the mouth, are represented on the plate.

## Page 297. COTTUS GRÆNLANDICUS.

PLATE 95, f. 2, two-thirds natural size.

A reference to this plate could not be made before, as it was executed after the description of the species had gone to press. The same parts are represented as in the figures of *Cottus asper*.

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## MOLLUSCA.

The few fresh-water Shells collected on the Expedition having been placed in the hands of Mr. James De Carle Sowerby, he kindly furnished me with the following list, in the year 1828.

Names.	Localities.
1. <i>Helix attenuata</i> . . . . .	Lakes Superior, Winipeg, and Saskatch. R.
2. „ <i>gularis</i> . . . . .	Ditto ditto ditto.
3. „ <i>rudis</i> . . . . .	Ditto ditto ditto.
4. „ <i>paludosus (minuta, Say)</i>	Ditto ditto ditto.
5. „ <i>albolabris</i> . . . . .	Ditto ditto ditto.
6. <i>Succinea putris</i> . . . . .	Ditto to Methy Lake (lat. 57°).
7. „ <i>ovalis</i> . . . . .	Ditto to the Saskatchewan River.
8. <i>Bulimus lubricus</i> . . . . .	Ditto.
9. <i>Melampus bidentatus, SAY (au- ricula, Lam., Conovulus, Montf.)</i>	Ditto to the Saskatchewan River.
10. <i>Valvata tricarinata</i> . . . . .	Ditto to Methy Lake.
11. „ <i>syncera</i> . . . . .	Methy Lake to Great Bear Lake (lat. 65°).
12. <i>Planorbis campanulatus (Helix) angulata, SHEPH., Lin. Tr.)</i>	Lake Superior to Saskatchewan.
13. „ <i>bicarinatus</i> . . . . .	Ditto ditto.
14. „ <i>trivalvis</i> . . . . .	Ditto ditto.
15. „ <i>sp. nova</i> . . . . .	Ditto ditto.
16. „ <i>albus</i> . . . . .	Ditto ditto.
17. „ <i>sp. nova</i> . . . . .	Ditto ditto.
18. „ <i>sp. nova contorto similis</i>	Ditto ditto.
19. „ <i>parvus</i> . . . . .	Methy Lake.
20. „ <i>sp. nova</i> . . . . .	Ditto to Great Bear Lake.
21. „ <i>sp. nova</i> . . . . .	Saskatchewan.
22. <i>Ancillus rivularis, SAY</i>	
23. <i>Physa rivalis</i>	
24. „ <i>turrita (elongata) SAY } (Bulla hypnorum, LINN.) }</i>	
25. „ <i>sp. nova</i> . . . . .	
26. „ <i>fontinalis</i> . . . . .	Methy Lake to Bear Lake.

Names.	Localities.
27. <i>Physa heterostropha</i> . . . .	Canada to Saskatchewan.
28. „ <i>ancillaria</i> , SAY . . . .	Ditto ditto.
29. „ <i>sp. nova</i> . . . .	Ditto to Methy Lake.
30. <i>Limnea n. sp. similis stagnali</i>	Lake Superior to Lake Winipeg.
31. „ <i>columella</i> . . . .	Ditto ditto.
32. „ <i>palustris</i> . . . .	Canada to Great Bear Lake.
33. „ <i>fossaria</i> . . . .	Ditto to Saskatchewan.
34. „ <i>n. sp.</i> . . . .	Ditto ditto.
35. „ <i>catascopium</i> . . . .	Ditto ditto.
36. „ <i>sp. dubia</i> . . . .	Ditto ditto.
37. „ <i>sp. n. leucostomæ similis</i>	Ditto ditto.
38. „ <i>sp. nova</i> . . . .	Ditto ditto.
39. <i>Melania conica</i> , SAY . . . .	Lake Superior ditto.
40. „ <i>sp. nova</i> . . . .	Ditto ditto.
41. „ <i>sp. nova</i> . . . .	Ditto ditto.
42. <i>Paludina decisa</i> , var. . . .	Ditto ditto.
43. „ <i>limosa</i> . . . .	Ditto to Methy Lake.
44. <i>Cyclas rhomboidea</i> . . . .	Ditto to Lake Winipeg.
45. „ <i>similis</i> . . . .	Ditto ditto.
46. „ ( <i>Pera</i> , Leach) <i>appendi-</i> <i>culata</i> . . . . }	Ditto ditto.
47. „ <i>calyculata</i> . . . .	Methy Lake.
48. „ <i>stagnicola</i> . . . .	Ditto.
49. „ <i>media</i> . . . .	Ditto.
50. „ <i>pulchella</i> . . . .	Ditto.
51. <i>Unio plicatus</i> . . . .	Saskatchewan.
52. „ <i>radiatus</i> . . . .	Ditto.
53. „ <i>radiatus</i> , var. . . .	Ditto.
54. „ <i>purpureus</i> . . . .	Ditto.
55. „ <i>purpureus</i> , var. . . .	Ditto.
56. <i>Anodon undulatus</i> . . . .	Ditto.
57. „ <i>anatinus</i> . . . .	Ditto.

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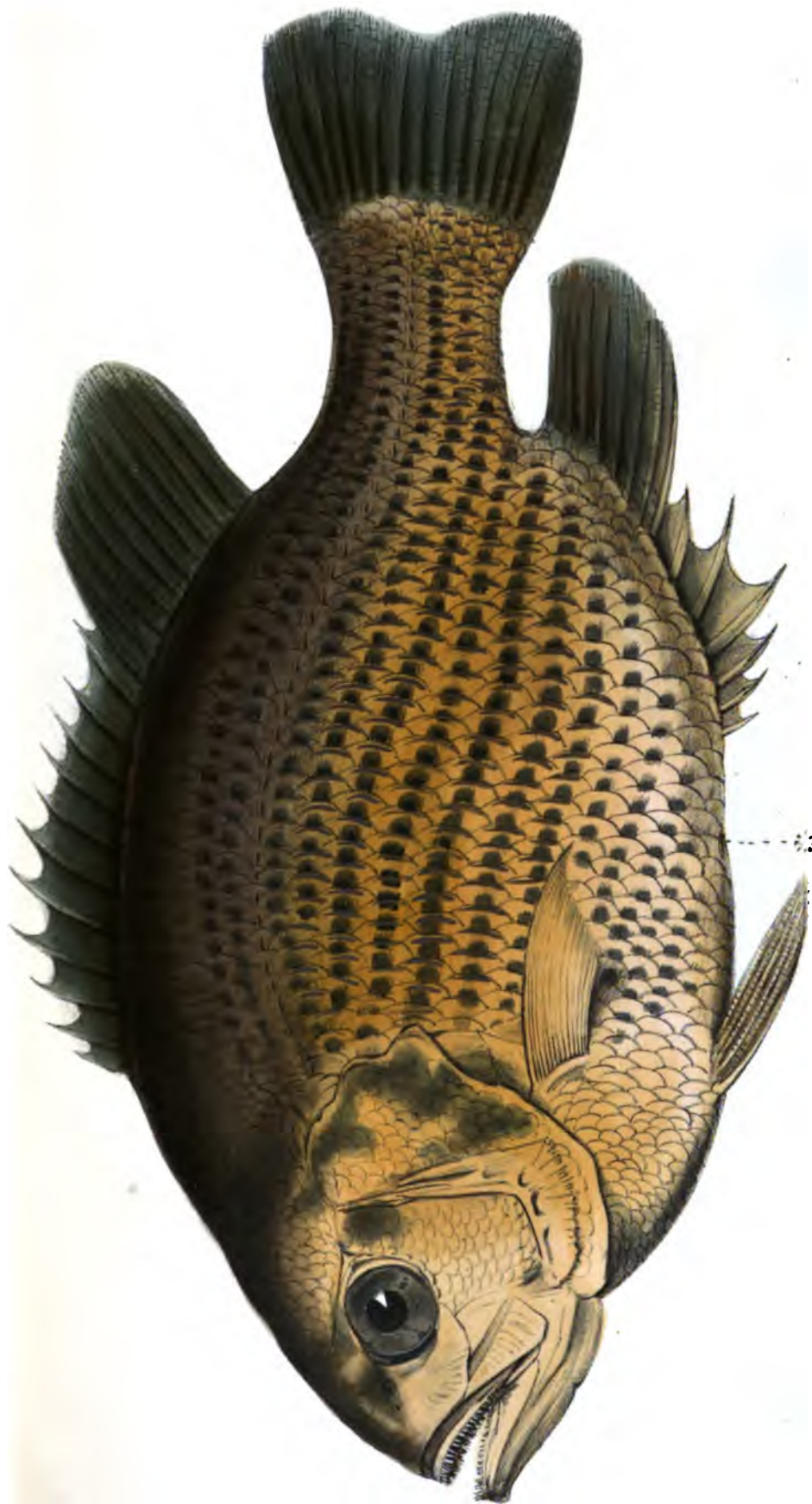
Painted by G. S. 1858

Drawn by W. H. S. 1858

*PERCA FLAVESCENS*, (Cuvier) *Yellow American Perch*.

Nat. Size.



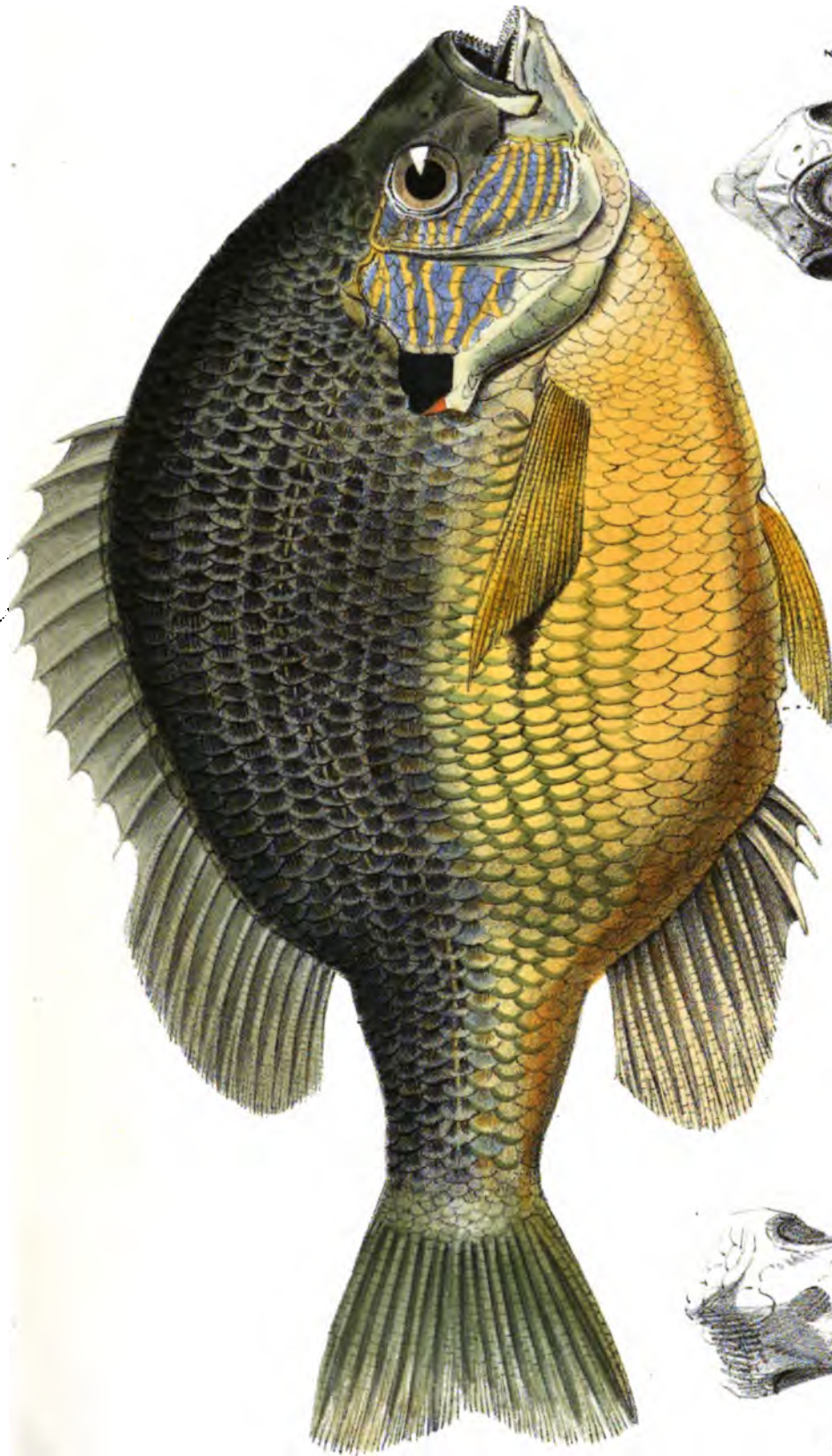


CENTRARCHUS AENEUS (Cuvier) *Bronzed Centrarohus.*

Nat Size

Princeton University

Division of Vertebrate Zoology



Printed by Goussier

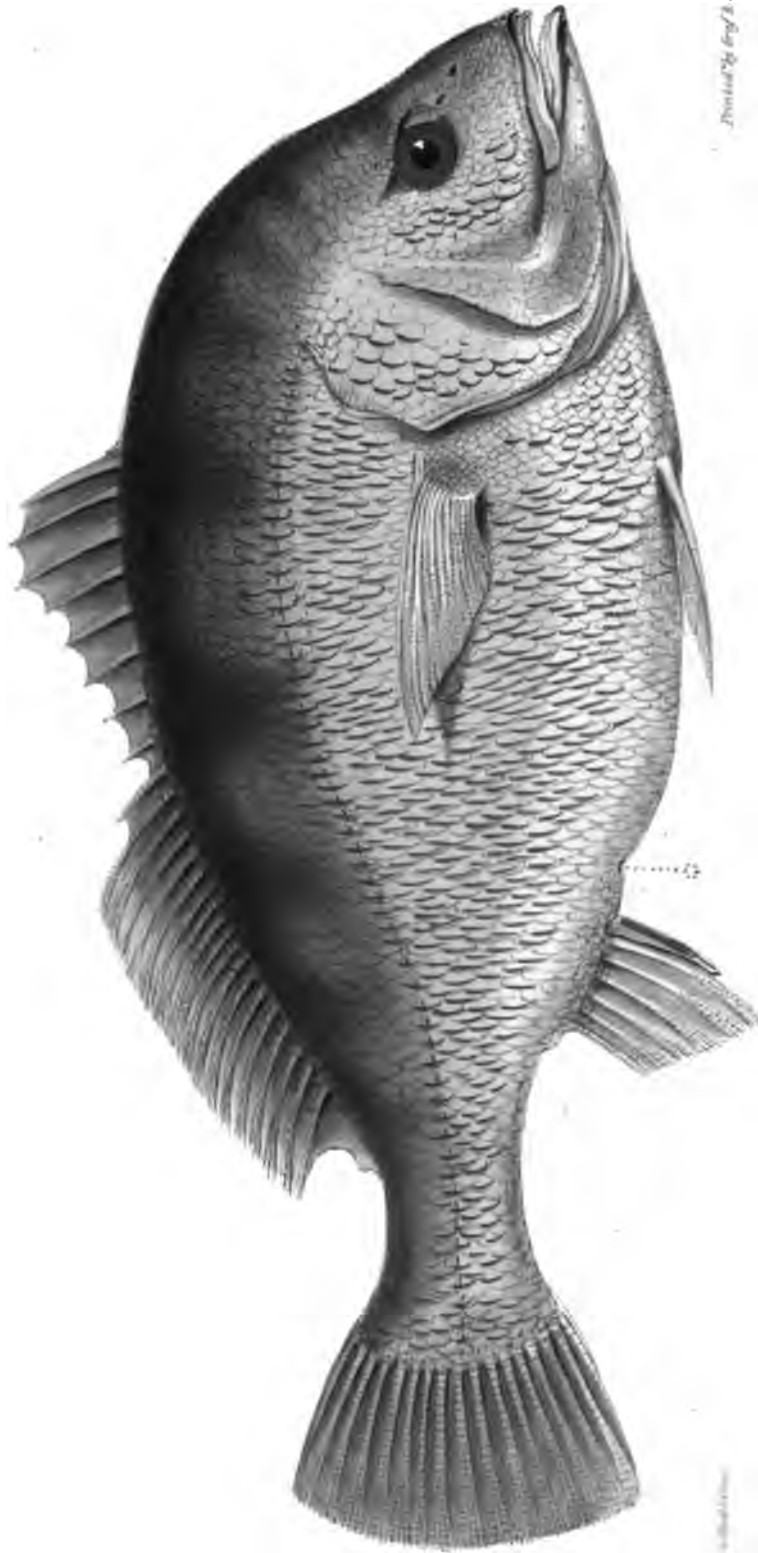


a

POMOTIS VULGARIS. (Cuvier) Common Pomotus.

Nat. Size.

Printed by Goussier



Illustrated by G. S. Cooper

From the Fishes of the Hawaiian Islands

*COERVINA RICHTERIDSENI (Cuvier) The Malashegane.*

*1/3 Nat. Size.*





Painted by G. F. S. Frost

**LEUCISCUS GRACILIS (Richardson) Saskatchewan Dace.**

$\frac{3}{4}$  Nat. Size.

in honor of Hermann Henslow



Printed by Goulet & Co.

**LEUCISCUS GRACILIS (Richardson) Saskatchewan Dace.**

$\frac{3}{4}$  Nat. Size.

in honor of Sir John Macdonald



Painted by Hugh De Vereux

**LEUCISCUS GRACILIS (Richardson) Saskatchewan Dace.**

$\frac{3}{4}$  Nat. Size.

en. Stone by W. H. Bennett, Vancouver



Engraved by R. G. Mearns

SALMO NAMAYCUSH. (Pennant) *The Namaycush.*  
 $\frac{1}{3}$  Nat. Size.

Drawn by Robinson



Plate 80.



From the collection of the U.S. Fish Commission

HALL & BROS. (Richardson) *Refs Arctic Salmon.*

$\frac{1}{4}$  Nat. Size.

*Drawn by Richardson Brothers*





S A L L C A L L P E S . (Richardson) Long-finned Trout.

1/3 Nat. Size.



Fig. 1.



SALMONITIDUS. (Richardson) *The Angmaleck.*



Fig. 2.



SALMOCHOIIDII. (Richardson.) *The Masamaacoosh.*  
1/3 Nat. Size.

*Drawn from the Museum of the University of Cambridge.*

*Printed by G. & J. Smeets.*



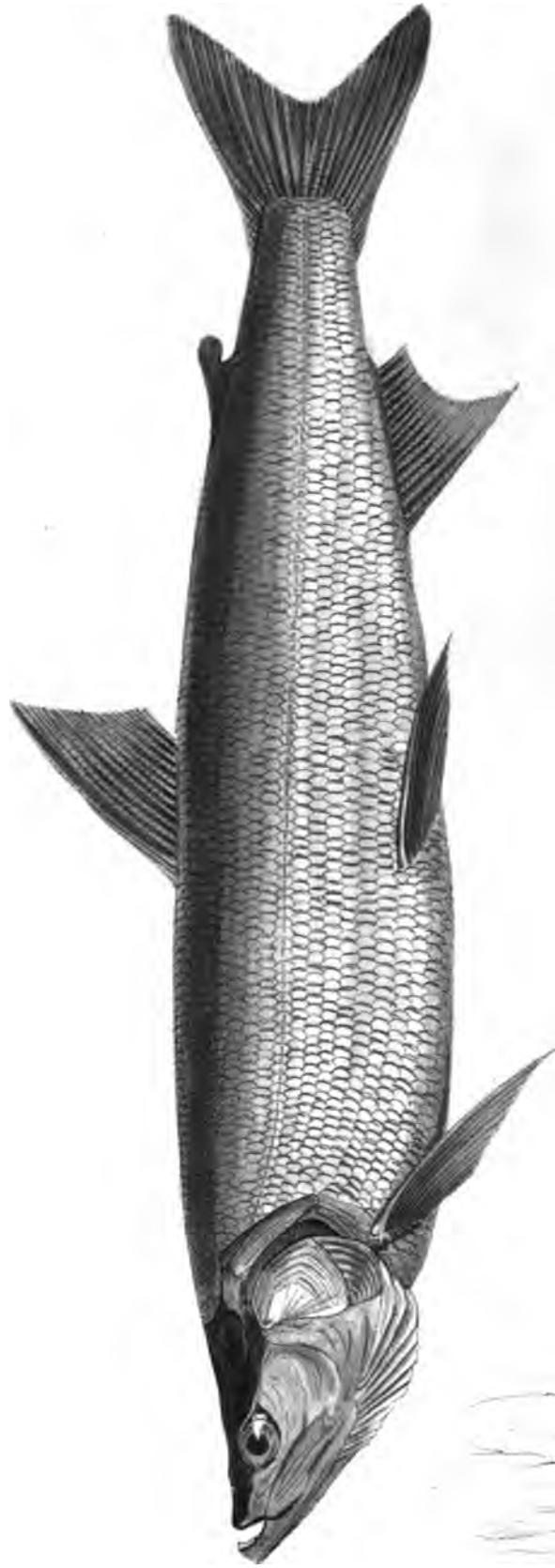
Fig. 1.

1. SALMO FONTINALIS | 2. SALMO HOGGII.

$\frac{1}{2}$  Nat. Size.



Fig. 2



**SALMO MACKENZII**. (Richardson) *The Inverness*.

About  $\frac{1}{2}$  Nat Size.

$\approx$  Nat Size.

2 Inches.



*a* Digitized by

*Drawn by Waterhouse-Humbert*



Fig. 1.

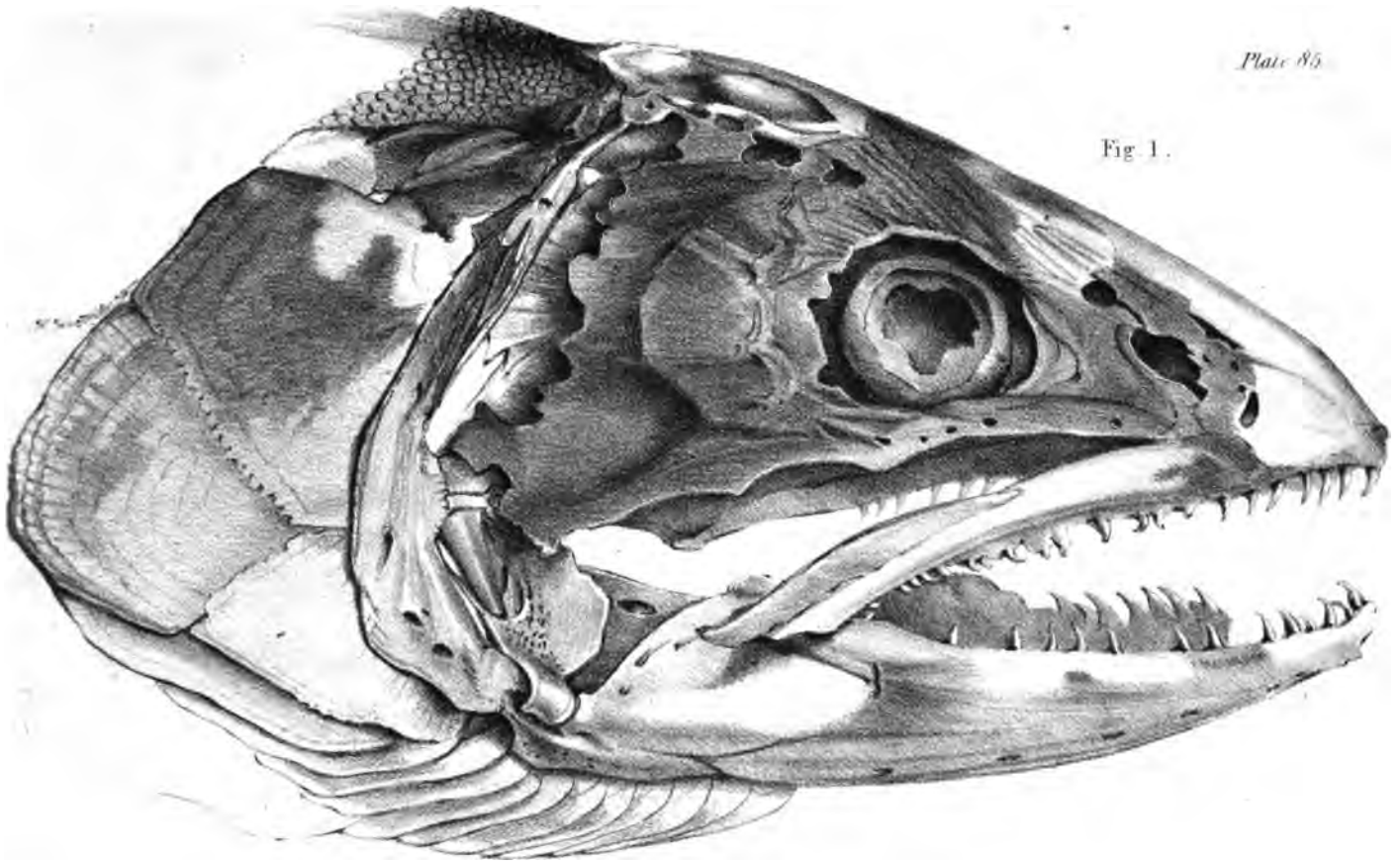
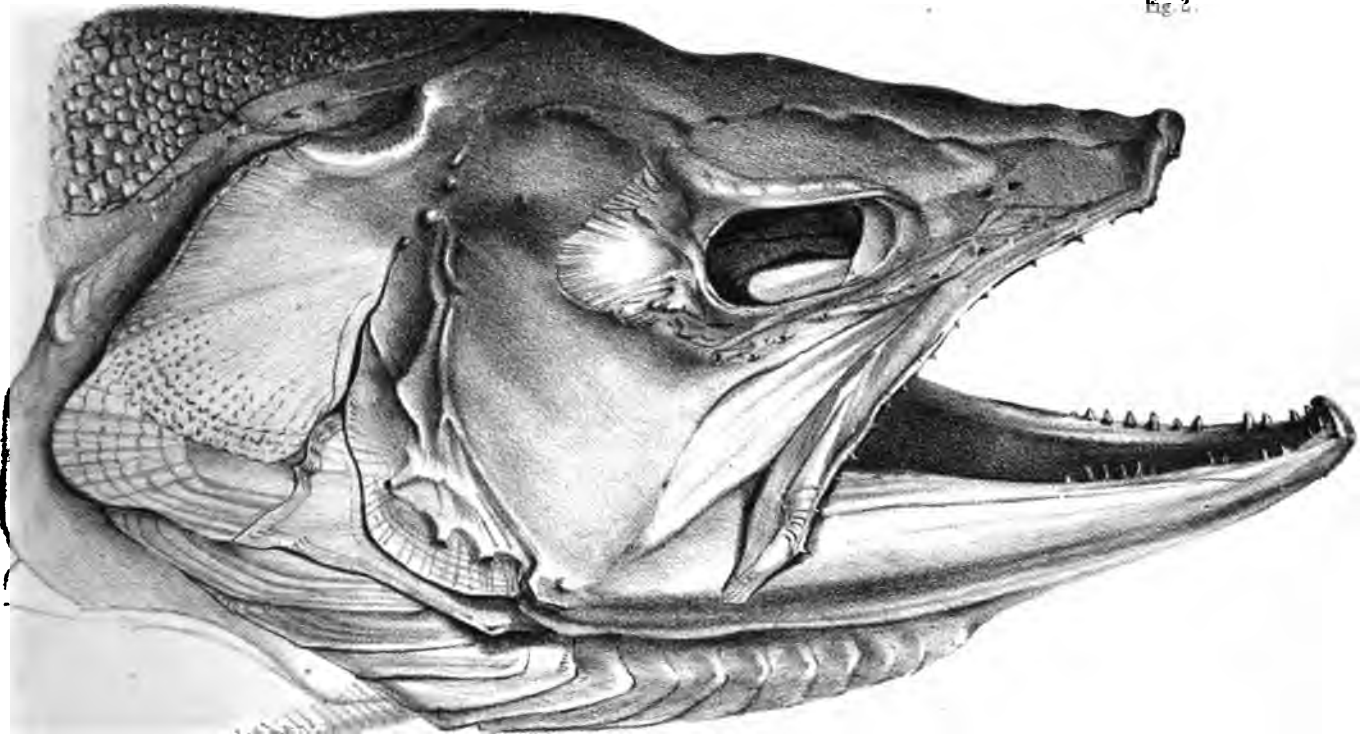


Fig. 1. *Salmo namaycush* · Fig. 2. *Salmo Rossii*.

Fig. 2.



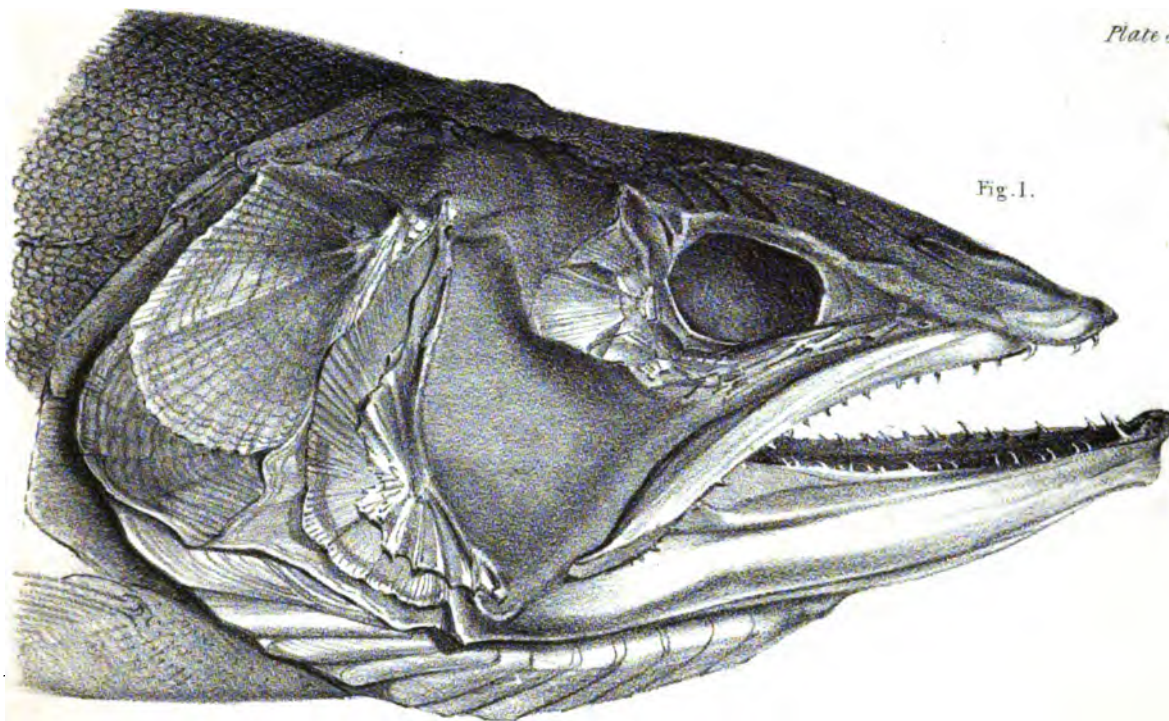


Fig. 1.

Fig. 1. *Salmo alipes.*

Fig. 2. *Salmo nitidus.*

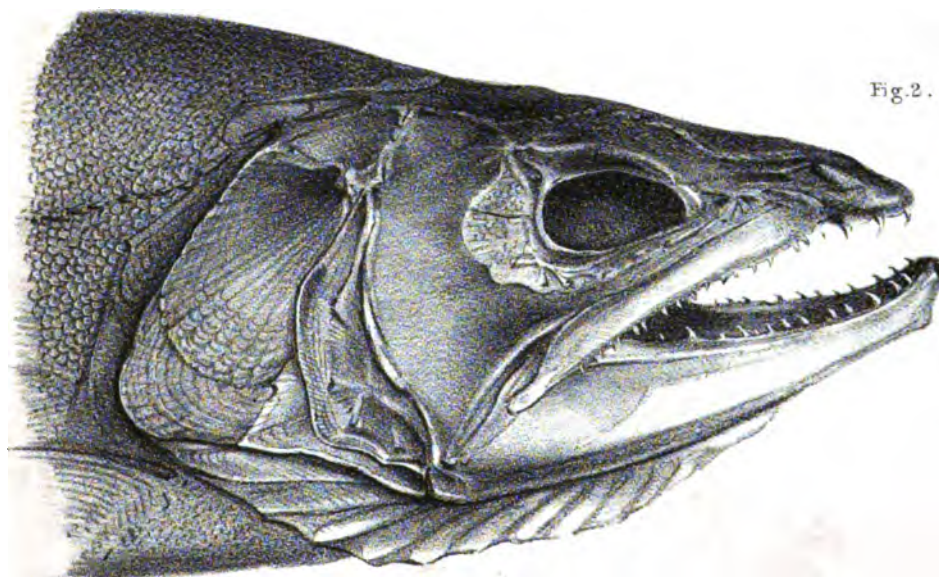


Fig. 2.

Fig. 1.

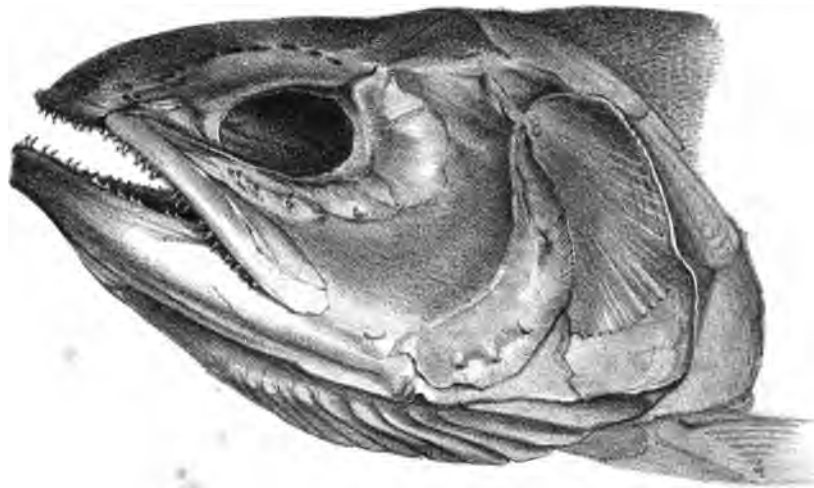
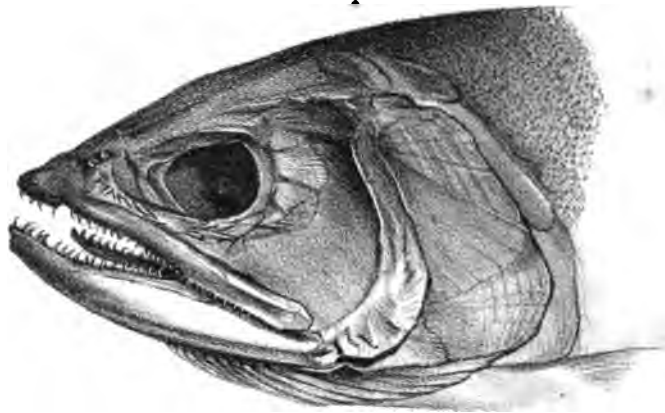


fig. 1. *Salmo hoodi* | fig. 2. *Salmo fontinalis*.

Nat. Size.

Fig. 2.



Drawn by Peterhouse Hancock

Printed by Gray & Son

Plat. 88.



THEYMALLUS SIGNIFER, (Rich.) Bach's Gonyling

1/2 Nat Size.

2/3 Nat Size.



Printed by Gray & Sons

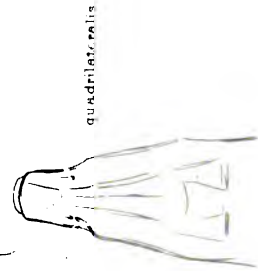
Drawn by W. Yarwood, Fawcett





A

FIG 1



B

1. *Coregonus*

*quadrilateralis*



A

FIG 2

2. *Coregonus*



B

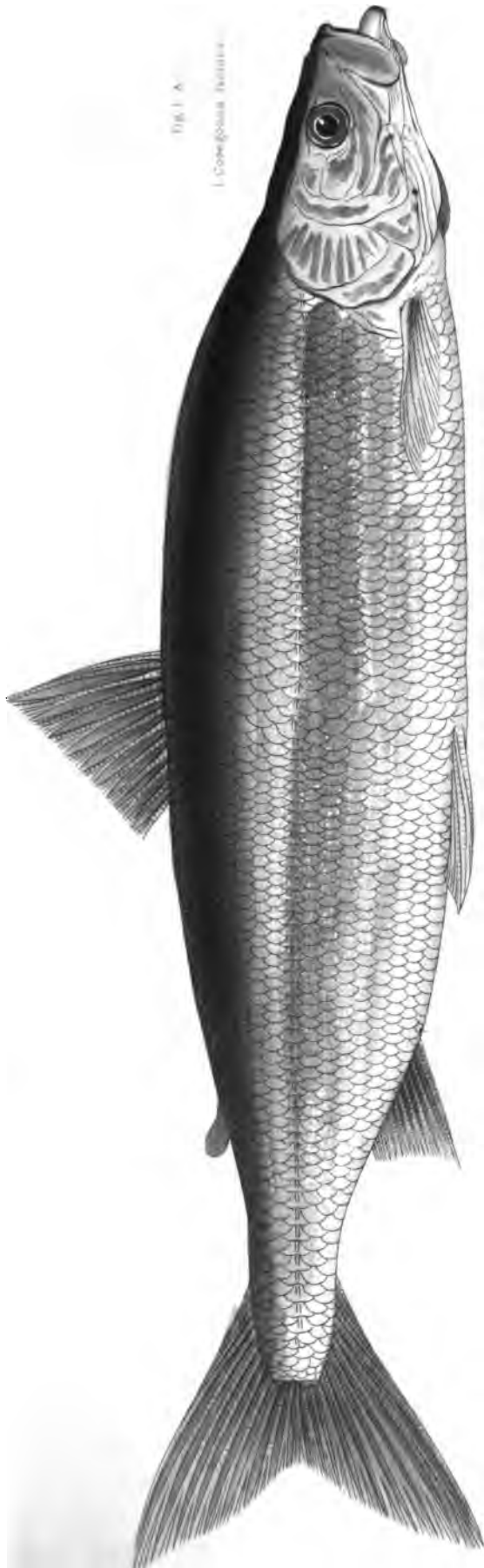


Fig. 1 A.  
Coregonus heterostictus.

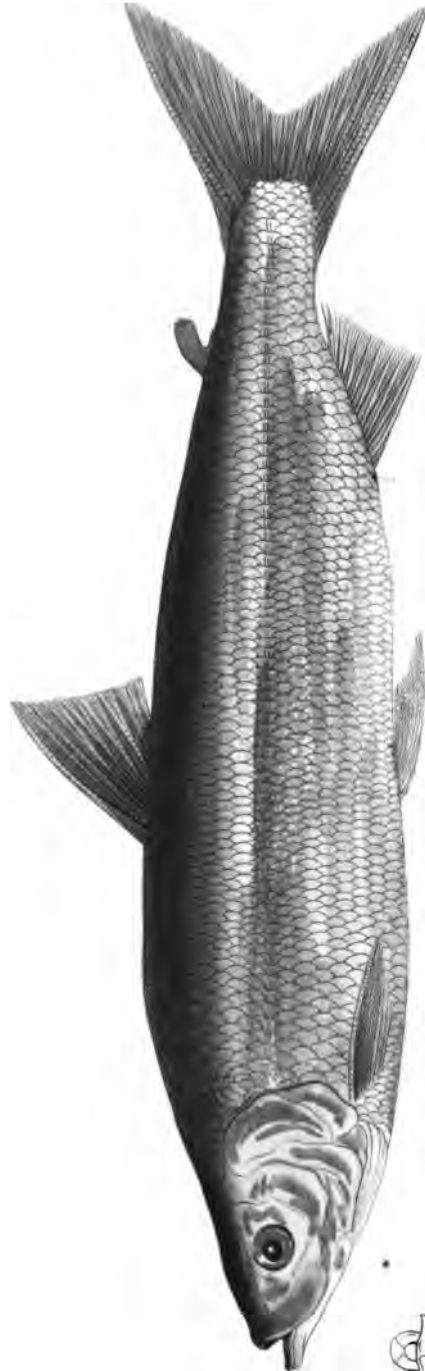
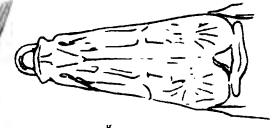
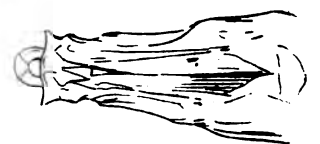


Fig. 2 A.

Fig. 2 B.  
Coregonus



Coregonus



hybridus.

Coregonus  
Fig. 1 B



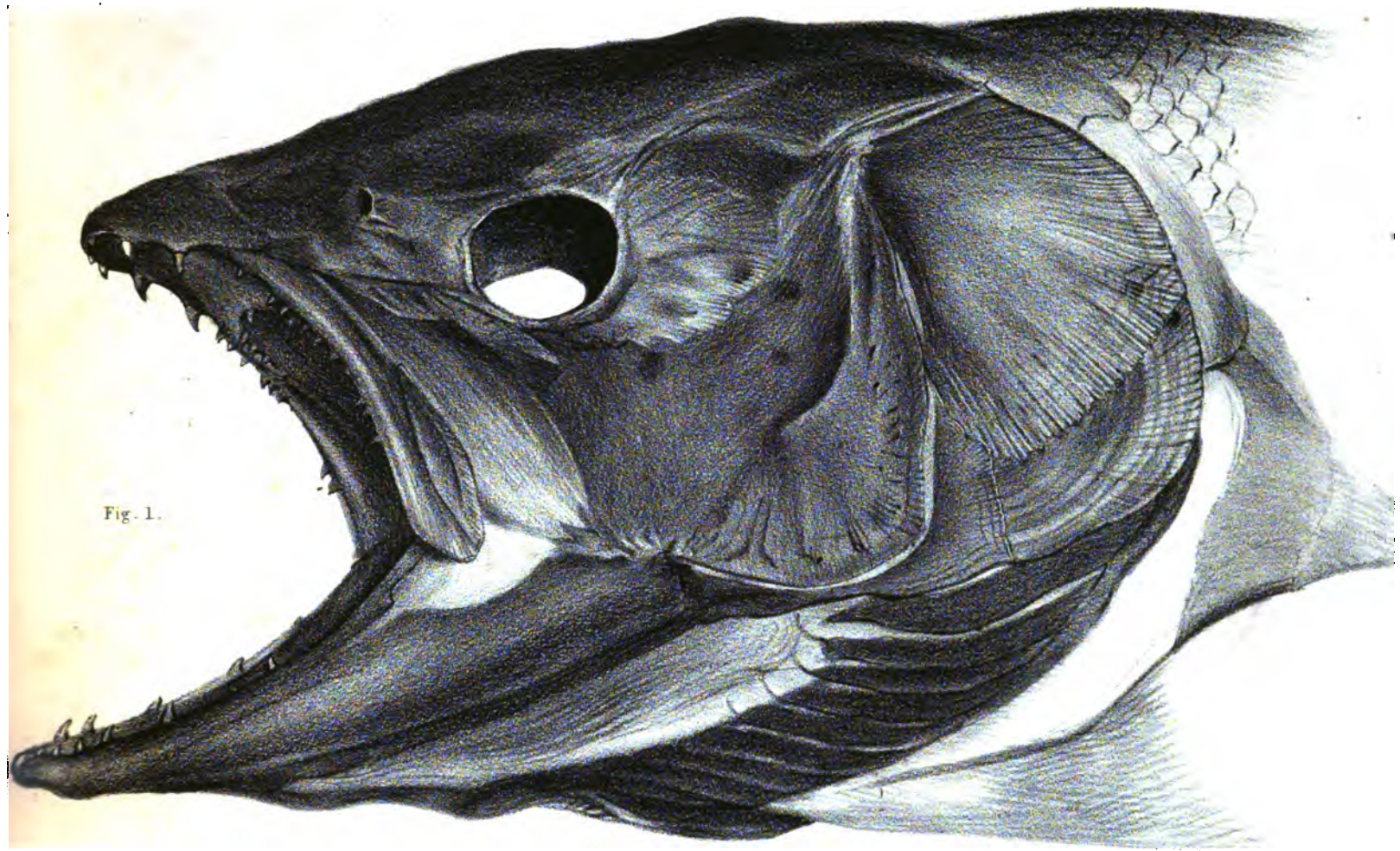


Fig. 1.

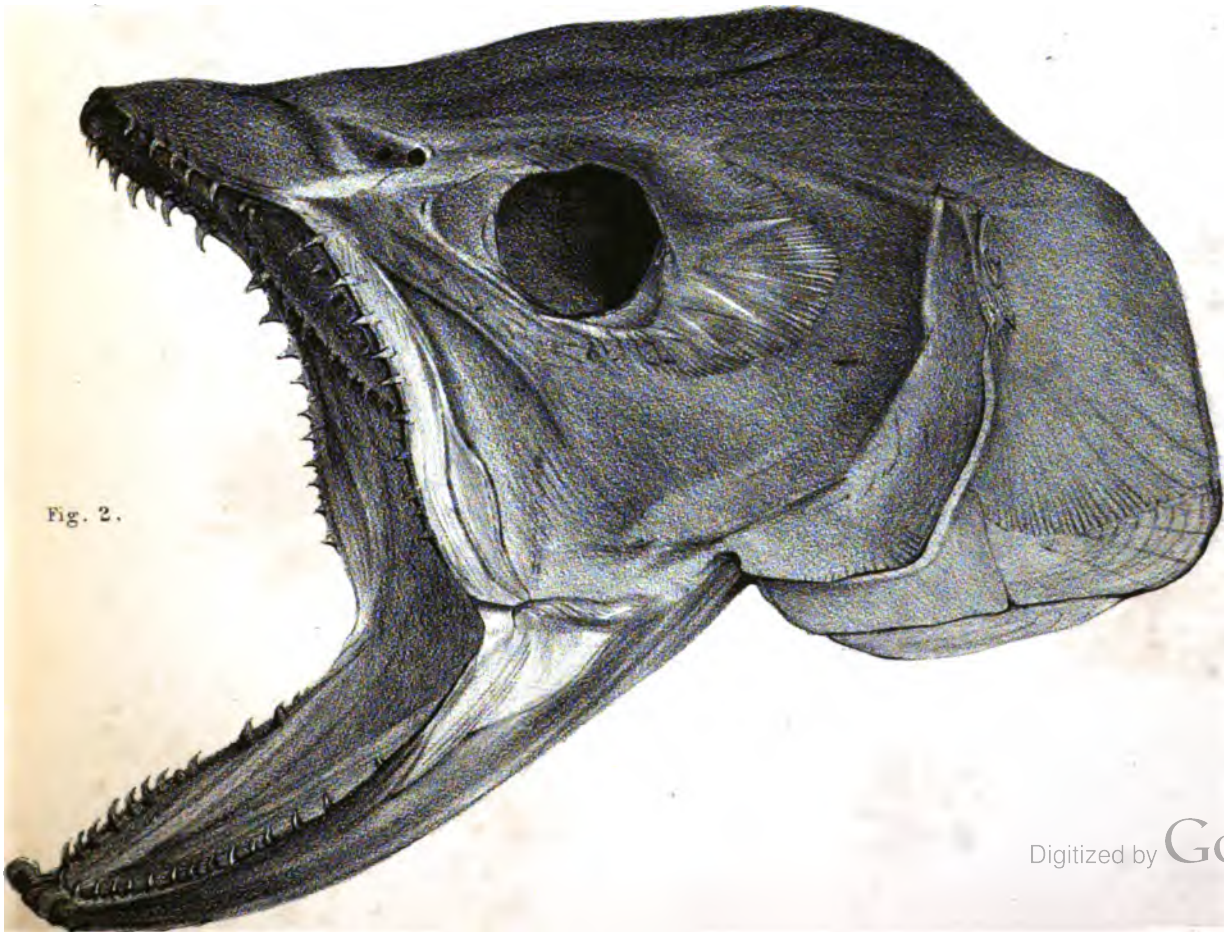
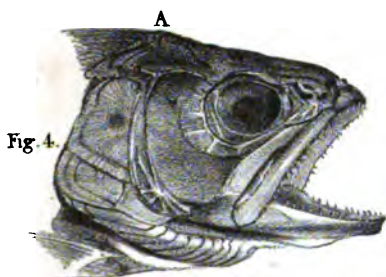
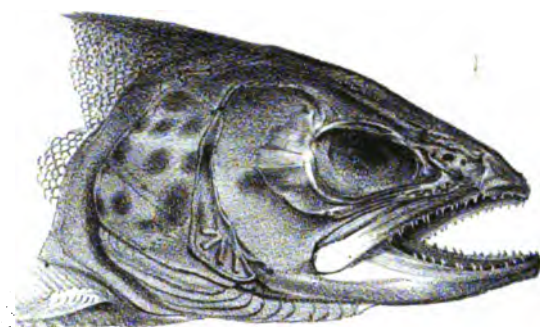
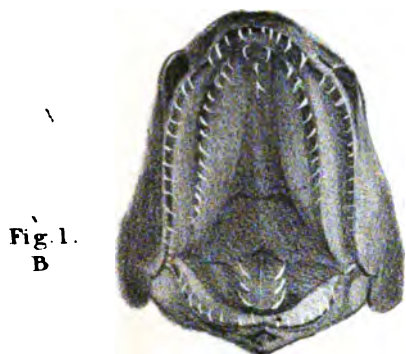
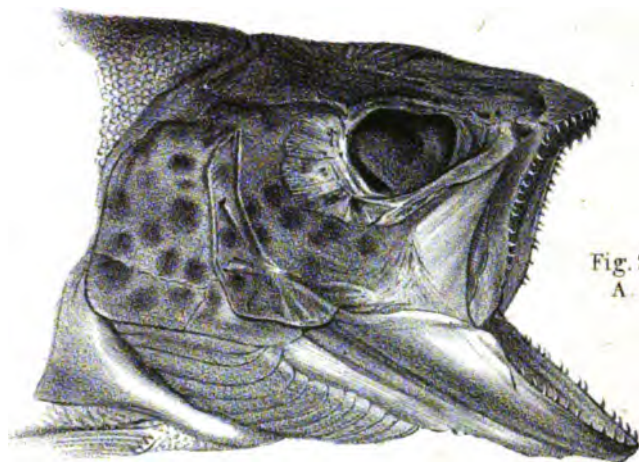
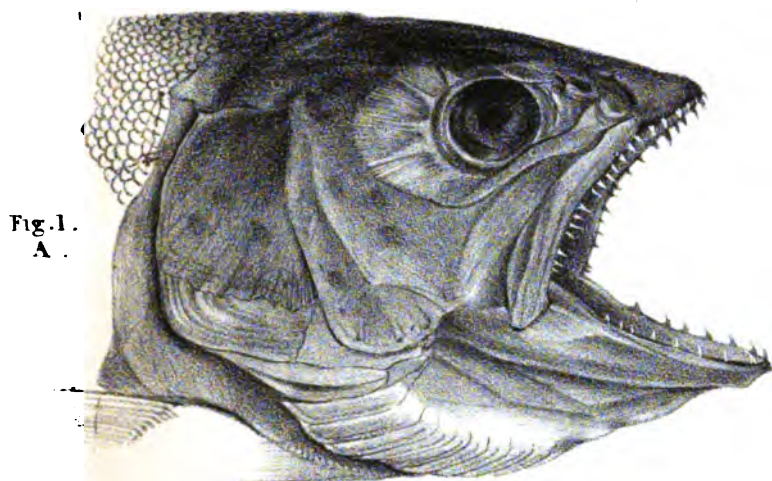


Fig. 2.



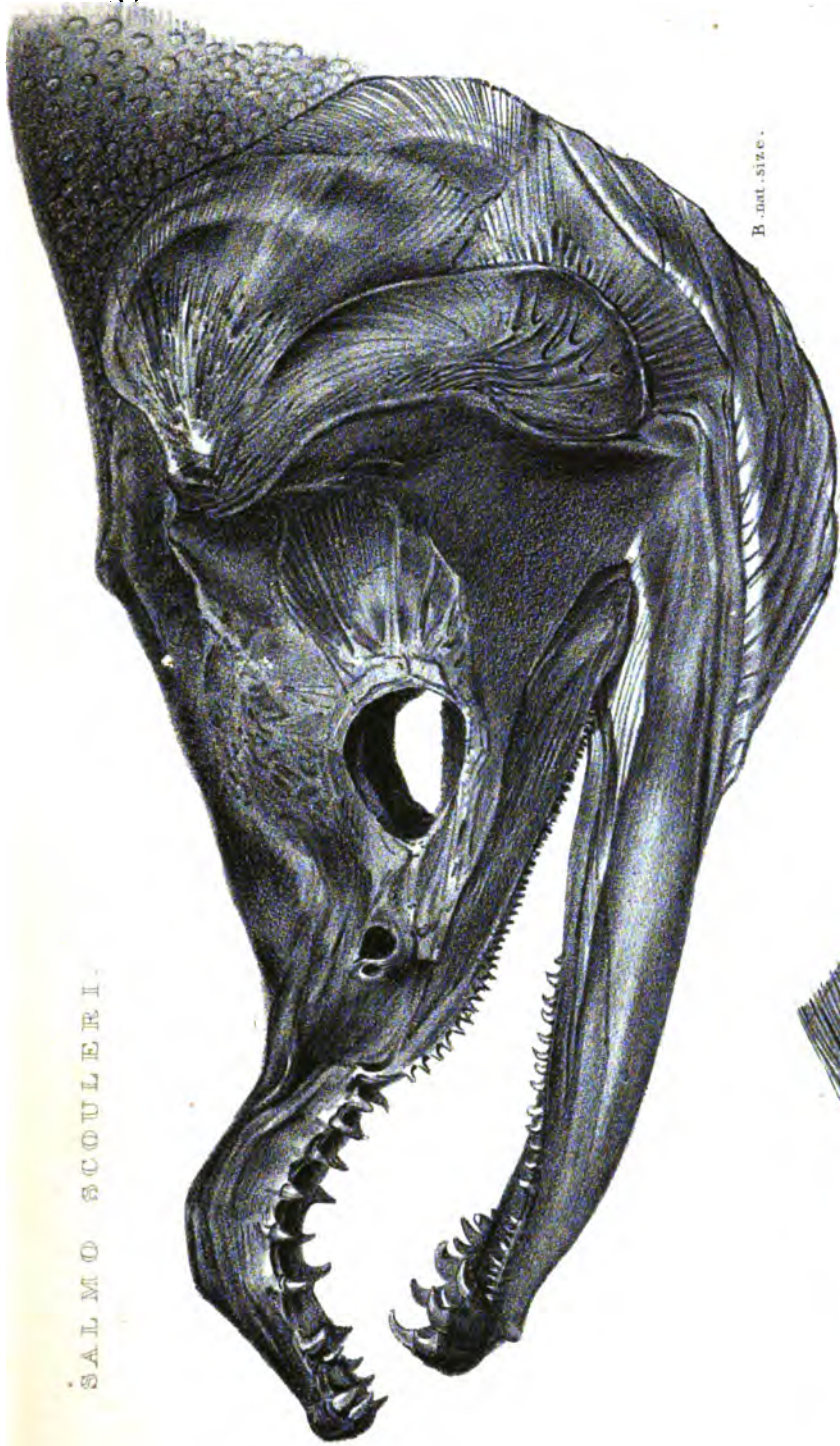


Drawn by Waterhouse Hankins

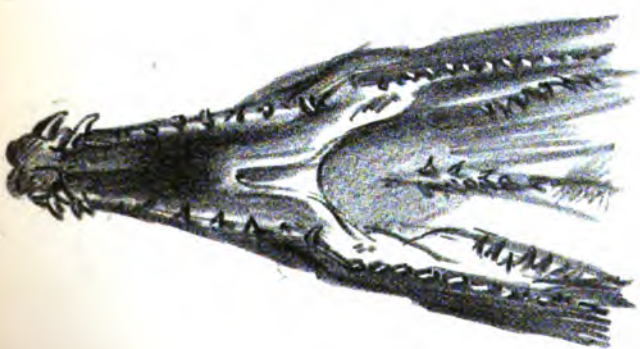
Printed by Graft Sons



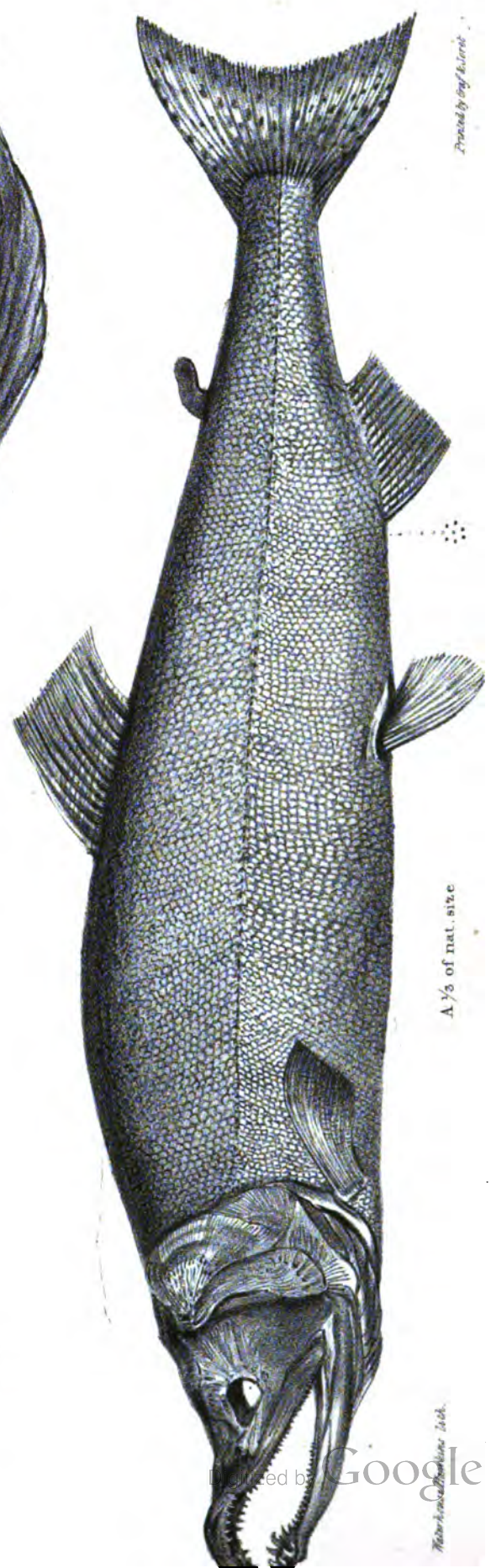
SALMO SCOTLIERI.



B. nat. size.



C. nat. size.



A 1/3 of nat. size

Printed by G. Scriver

Illustrated by J. G. S. S. S.



Fig 1  
*Salmo Mackenzii* p 133



Fig 2  
*Salmo Albus* p 149 {  
a  
b  
c

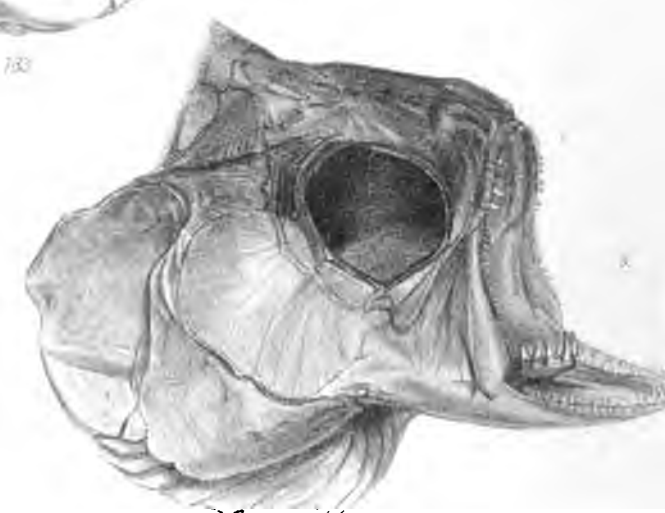


Fig 3  
*Hiodon chrysops* p 242



b



Digitized by Google



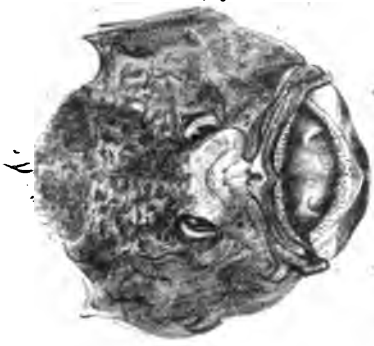


Fig. 1

*Parrotichthys orbis* (P. 246)

Fig. 2

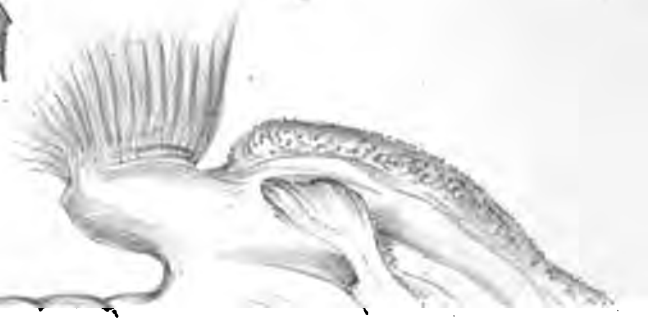
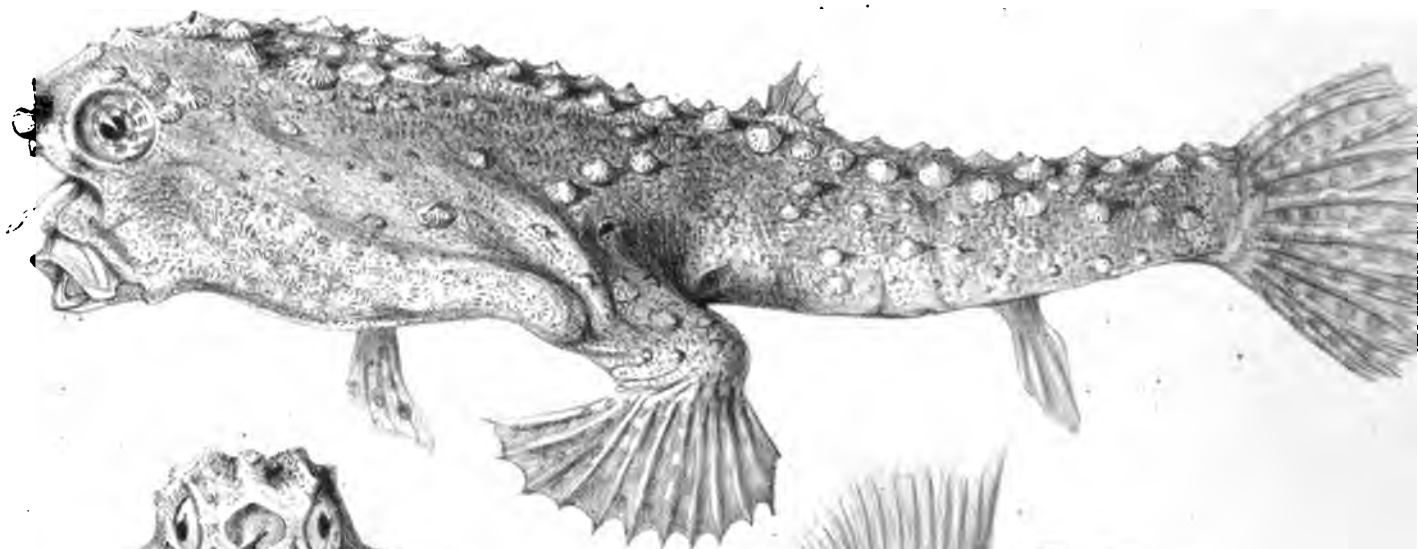
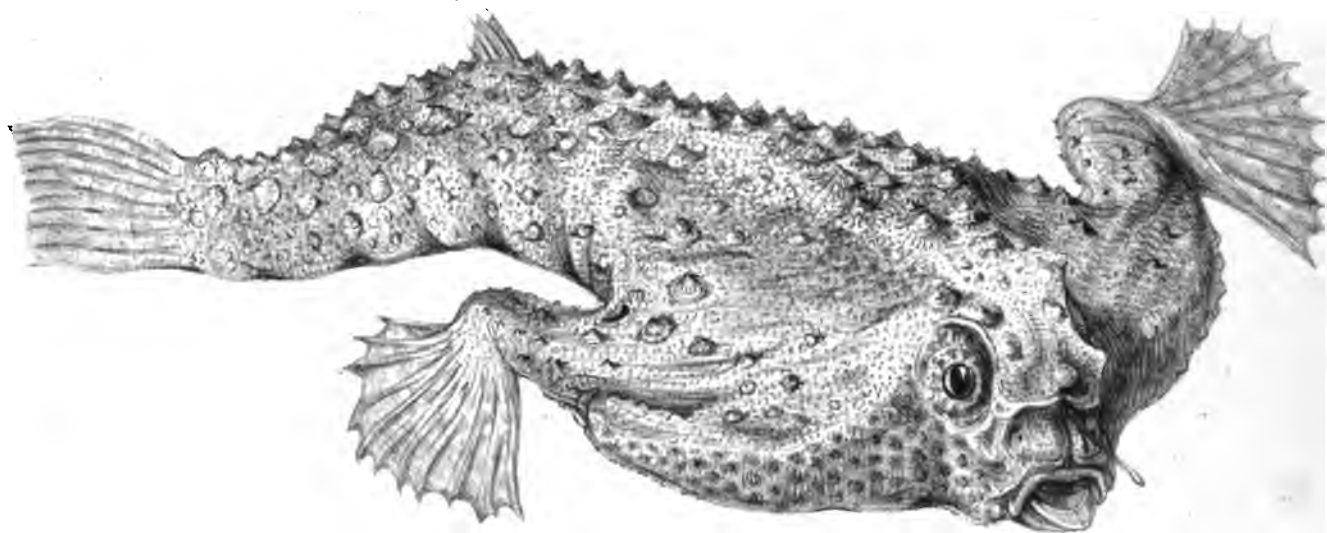
*Parrotichthys orbis* (P. 246)

Fig. 3

*Parrotichthys orbis* (P. 246)

Fig. 4







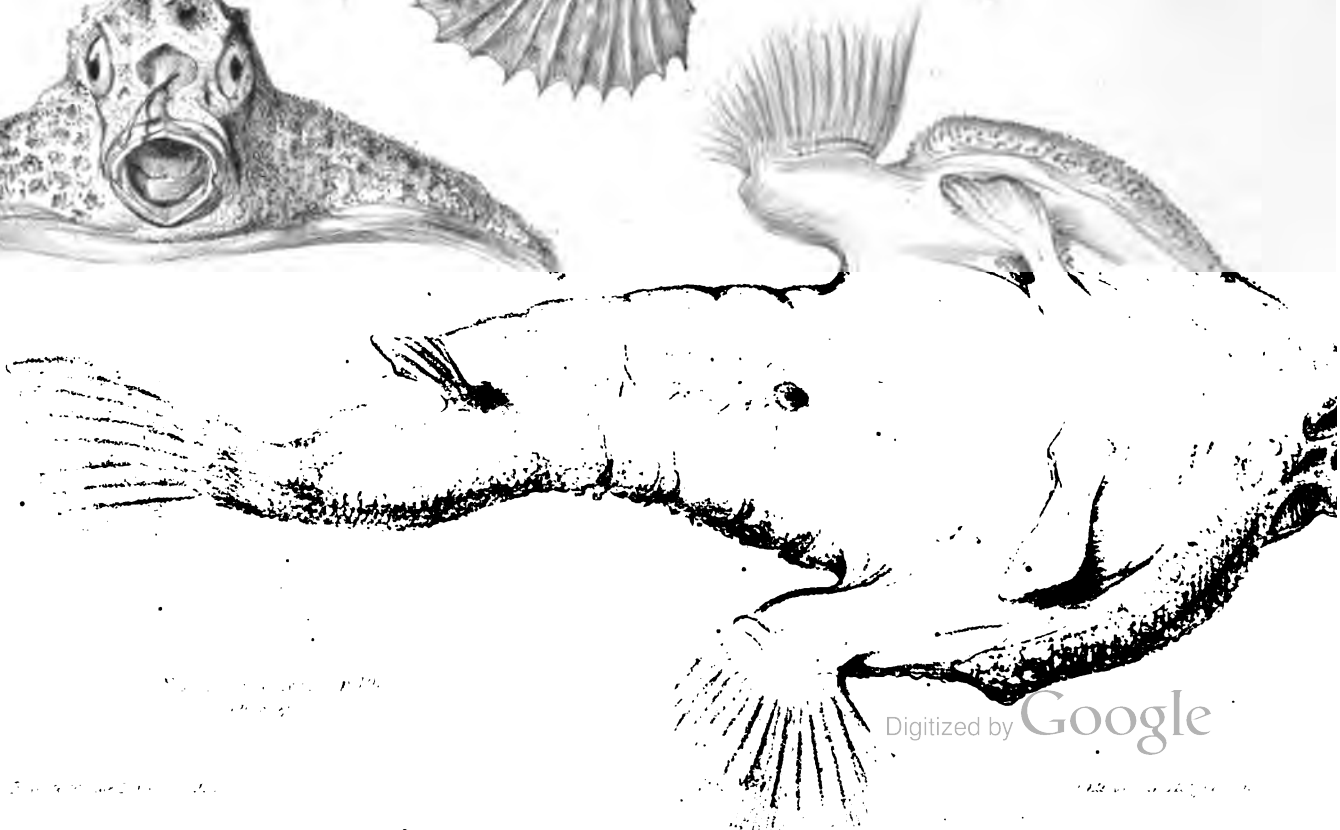
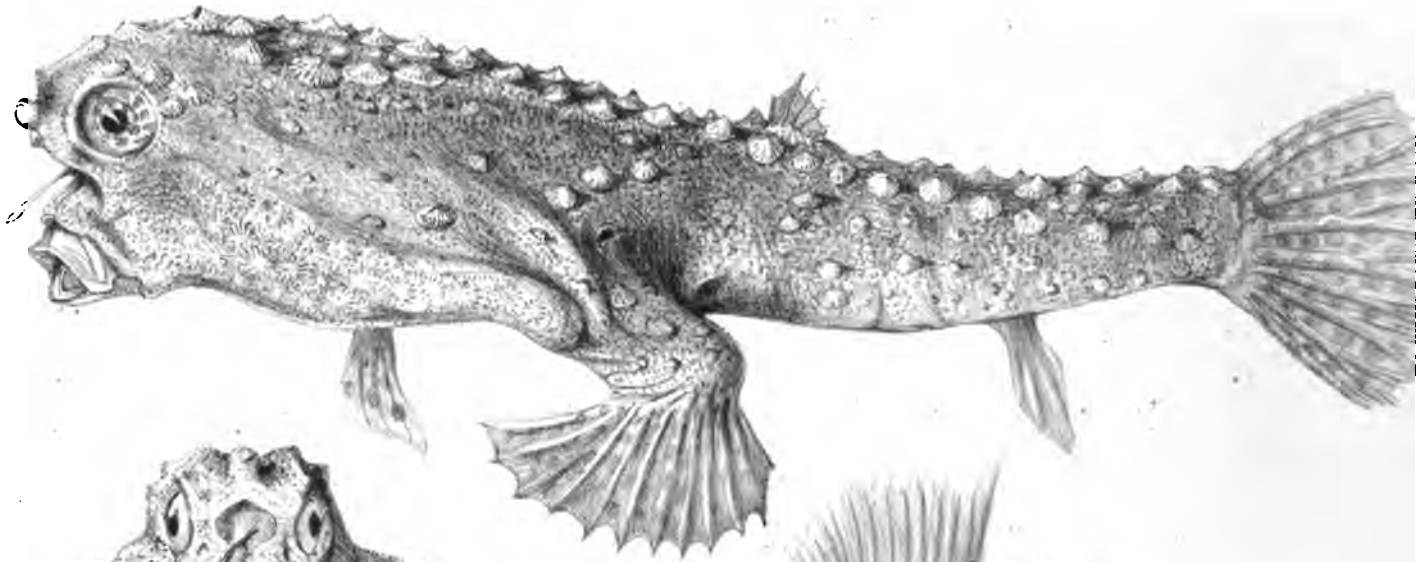
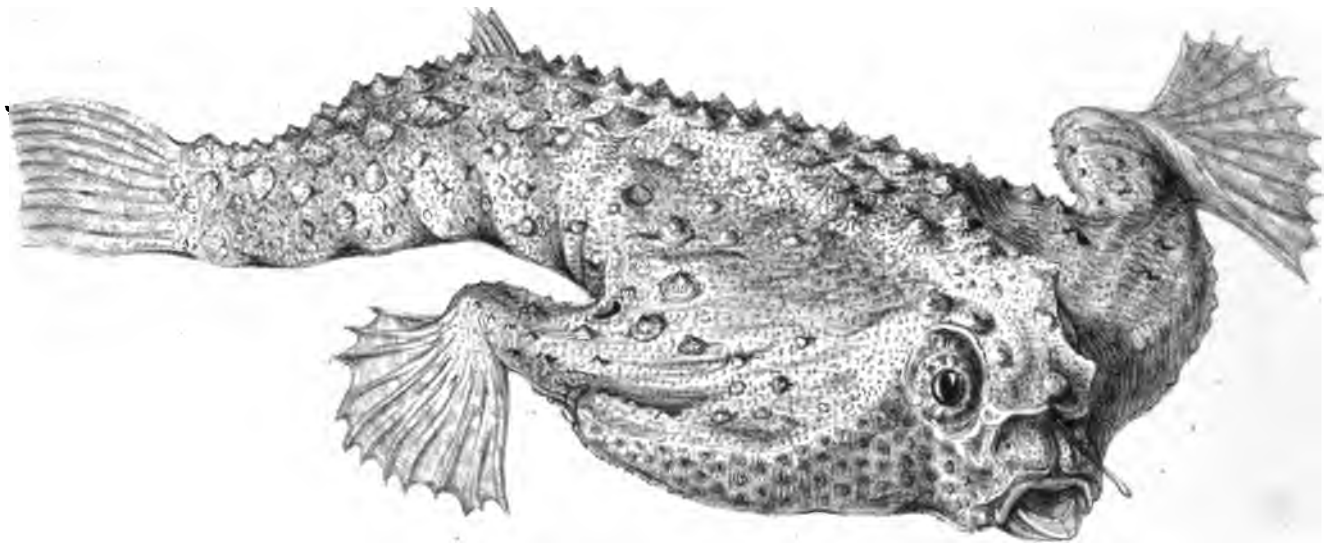




Fig. 1.  
*Acipenser Rupestris*  
1/2 Nat. size.

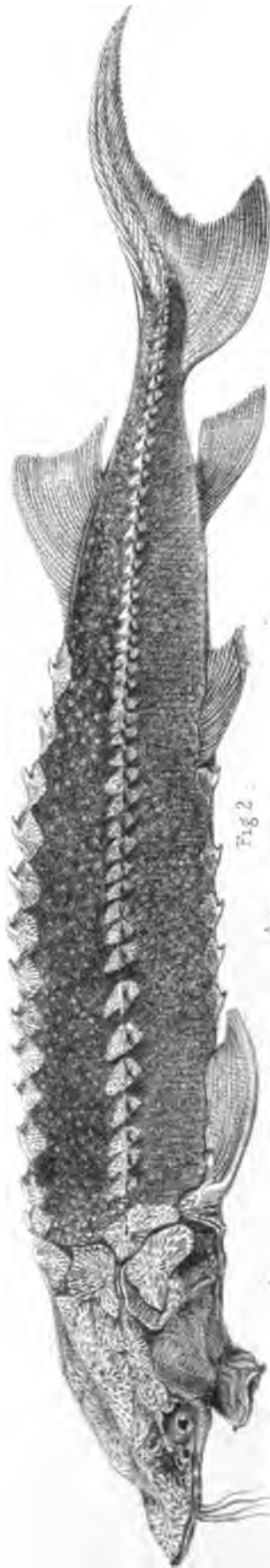
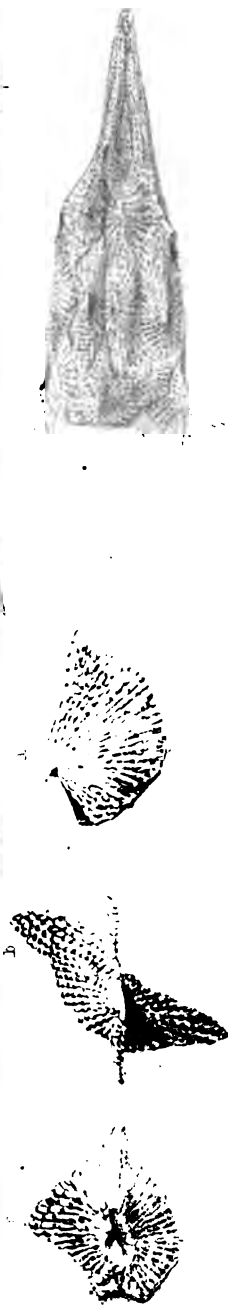


Fig. 2.  
*Acipenser transmontanus*  
1/3 Nat. size.

